IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF PENNSYLVANIA

Civil Action No. 96CV-5903

STEVEN R. ARCH, CLARAN McNALLY, RODWELL, BARBARA SLIVAK, and JOHN COMPANY, et al., Defendants.

:WILLIAM BARNES, :CATHERINE POTTS, NORMA :SALZMAN, EDWARD J. :TEAGLE,

: Plaintiffs, vs. :THE AMERICAN TOBACCO

Deposition of: ROBERT A. LLOYD, JR., Ph.D. (Volume I)

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TRANSCRIPT of testimony as taken by and before Elizabeth S. Girvan, Shorthand Reporter and Notary Public in and for the State of North Carolina, at the offices of Womble, Carlyle, Sandridge & Rice, 200 West Second Street, Suite 1600, Winston-Salem, North Carolina, on Wednesday, October 1, 1997, commencing at 9:02 in the forenoon.

A P P E A R A N C E S:

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BY: MARILYN R. FORBES, ESQ. CHRISTOPHER A. KREINER, ESQ.
For the Defendant, R.J. Reynolds (910) 733-2227
ALSO PRESENT:
LARRY SCHADLE, VIDEOGRAPHER

I N D E X

WITNESS	DIRECT	CROSS	REDIRECT	RECROSS
DR. ROBERT A. LLOYD, JR.:				
Ms. Knisely	5			

E X H I B I T S

NUMBER	DESCRIPTION	IDENTIFICATION
1	- Notice of Deposition	10
2	- Document consisting or 17 pages entitled Management Equity Participation Plan	123
3	- Document consisting of 3 pages entitled Management Equity Participation	128

VIDEOGRAPHER: This is the videotaped deposition of Dr. Robert Lloyd, Jr., Ph.D., taken by the plaintiff, in the matter of William Barnes, et al., Plaintiffs, versus The American Tobacco Company, Incorporated, et al., Defendants, Civil Action Number 96CV5903.

This deposition is being held in the law offices of Womble, Carlisle, Sandridge & Rice, located at 200 West Second Street, Winston-Salem, North Carolina. Today's date is October 1st, 1997. The time is 9:02 a.m.

The court reporter's name is Beth Girvan, representing Waga & Spinelli Court Reporting, located in Roseland, New Jersey. The videographer is Larry Schadle, also representing Waga & Spinelli Court Reporting.

Would counsel now please introduce themselves.

MS. FORBES: Marilyn Forbes

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appearing on behalf of R.J. Reynolds.
MR. KREINER: Chris Kreiner, also appearing on behalf of R.J. Reynolds Tobacco.
MS. KNISELY: Sherrice Knisely for plaintiffs.
MR. VILLALOBOS: Paul Villalobos for plaintiffs.
VIDEOGRAPHER: Would the court reporter please swear in the witness.

ROBERT A. LLOYD, JR., Ph.D.,
having been first duly sworn, was examined and testified as follows:

EXAMINATION

BY MS. KNISELY:

Q. Doctor, could you please state your full name for the record.
A. My name is Robert Austin, A-U-S-T-I-N, Lloyd, L-L-O-Y-D, Jr.
Q. I'm going to be asking you some questions today and tomorrow in this lawsuit, but before I start, I wanted to give you some basic instructions.

If at any time I ask you a question that you do not understand, I would ask that you tell me, and I will do my best to -- to rephrase the question so that you do understand it. If you answer the question and do not tell me you don't understand, I will assume that you answered the question as honestly and accurately as you could.

If at any point in time you want to take any breaks, that is certainly fine. Let us know, and we'll be happy to accommodate you.

I understand you're represented by two counsel here today. And do you have any questions about the procedure so far?

A. I don't think so, so far.
Q. Can you tell me your date of birth?
A. 5/11/40.
Q. And your current address?
A. [DELETE].
Q. And how long have you lived there?
A. Almost eight years.
Q. Do you have any plans to move in the near future?
A. No, I don't.
Q. Are you married?
A. No. I'm divorced.
Q. Do you have children?
A. Yes, I do.
Q. How many?
A. One son.
Q. And his name?
A. Daniel Hamilton Lloyd.
Q. And how old is your son?
A. He's 25.
Q. Has your ex-wife ever worked for Reynolds Tobacco Company?
A. No, she has not.
Q. Has your son ever worked for Reynolds Tobacco Company?
A. No, he has not.
Q. Were you in the military?
A. No, I was not.

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Q. Where did you graduate from high school?
A. High Point, North Carolina.
Q. When did you graduate?
A. 1958.
Q. Where did you go to college?
A. High Point College.
Q. And when did you graduate?
A. 1962.
Q. And what was your degree in?
A. B.S. in chemistry.
Q. Where did you attend graduate school?
A. Clemson University.
Q. And when did you graduate?
A. Let's see. Master's in 1965.
Q. Master's in science?
A. Master's in chemistry.
Q. 1965?
A. Right.
Q. Did you go on to get an additional degree?
A. Yes. Ph.D. in 1968.
Q. And that --
A. Organic chemistry.
Q. Do you hold any license -- professional licenses?
A. I'm sorry. I didn't hear all the question.
Q. Do you hold any professional licenses?
A. No.
Q. Have you ever taught any courses?
A. Not since I was a graduate student.
Q. What courses did you teach when you were a graduate student?
A. I was a teaching assistant while I was in graduate school, and I taught general chemistry and organic chemistry at Clemson.
Q. Do you have any publications in your name?
A. Yes, I do.
Q. How many publications?
A. I don't really remember how many. It's not a great many. Probably five or six.
Q. What subject areas are those publications in?
A. One is -- was published in the "Journal of the American Chemical Society." I don't remember the year. It was some of the work that I did on my master's in graduate school. Involved complexation of sodium potassium compounds. It was a very unusual compound.
Q. What was your doctoral thesis in?
A. My doctoral thesis was in the area of NMR studies of particular ketenimines.
Q. What does NMR stand for?
A. NMR stands for nuclear magnetic resonance spectroscopy.
Q. Your other publications, do you recall where they were published?
A. I've published some work that I've done with the company in tobacco science.
Q. You say "with the company." Reynolds Tobacco?
A. With Reynolds, yes.
Q. And what would those publications be?
A. Isolation and identification of compounds from flue-cured tobacco, essential oils. And there may be some other types of tobacco as well. I'm

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not sure at this point. It was a long time ago.
Q. Have we covered all of the subject matters of your publications?
A. I don't really remember what most of them are at this point. As I said, there's somewhere between five and eight.
Q. Do you have a list of your publications?
A. Somewhere, yes.
Q. Do you have copies of your publications?
A. I'm sure I could get them.
Q. Has anybody asked you to provide them?
A. No, not to my knowledge.

MS. KNISELY: I would like to mark as Plaintiff's Exhibit 1 the Deposition Notice in this case.

(EXHIBIT NUMBER 1 WAS MARKED FOR IDENTIFICATION)

BY MS. KNISELY:

Q. Doctor, I would like to show you what I've marked as Plaintiff's 1. It's a Deposition Notice for your deposition here today. Have you ever seen that document?
A. Yes, I've seen the document.
Q. When did you see the document?
A. Approximately seven o'clock last night. This is a clearer copy.

MS. FORBES: Unfortunately, we were only served by fax on Friday, so we didn't even have an original.

MS. KNISELY: Actually the service was done on Thursday to your -- all counsel of record in the case.

BY MS. KNISELY:

Q. Doctor, did anybody ask you to collect any documents that would be responsive to that document request?
A. I think at that point, I'll defer to my attorneys.

MS. FORBES: Ms. Knisely, as you know, paper discovery in this case has been over a long time ago. You've been on notice of that since July.

It is the position that -- of R.J. Reynolds that you had an opportunity to serve request for production of documents on the company. That's what you do with current employees.

And, as we did in Gary Burger's deposition and the deposition of Monday and Tuesday, this is simply too late, too massive, and out of time.

BY MS. KNISELY:

Q. Did anybody ask you to collect those documents that were responsive?

MS. FORBES: No, we are not asking him to collect those responsive documents.

BY MS. KNISELY:

Q. So, you -- you were not asked?
A. No.
Q. And just for the record, you've brought no documents with you here today?
A. That's correct.
Q. Have you ever been deposed before?
A. Yes, I have.
Q. And when was that?

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A. 1991.
Q. And in what case?
A. Cooper.
Q. And can you tell me on what issues you were deposed? What was the subject matter?
A. Wide-ranging issues.
Q. Was it a lawsuit in which Reynolds was sued in its capacity as a tobacco company related to health issues?
MS. FORBES: Objection to the form. He can't comment on what that lawsuit was about.
I mean, to the best you can generally describe what you know as a chemist, go ahead.
BY MS. KNISELY:
Q. Doctor, do you have an understanding as to what the Cooper lawsuit involved?
A. Not really, no. I was deposed in it.
Q. Do you know who the plaintiff -- what the plaintiff was claiming?
A. No, I don't.
Q. Is that the only time you've given a deposition?
A. Yes, it is.
Q. Have you ever been -- other than the Cooper case, have you ever been involved in any other lawsuits?
A. No, I don't think so.
Q. Have you given any in-court testimony?
A. No.
Q. Have you given any sworn statements?
A. I don't remember any, no.
Q. Have you made any unsworn statements?
MS. FORBES: Well, objection. Has he ever made a statement?
MS. KNISELY: Has he ever made any unsworn statements.
BY MS. KNISELY:
Q. Have you ever made any statements that -- let me define it a bit.
There is a legal term called an unsworn statement that carries a line with it to advise the signer of that document that what they are signing subjects them to certain sanctions as an unsworn statement for providing unaccurate information in that statement.
Have you ever signed such a statement?
A. I don't believe so.
Q. Have you ever been contacted by the FBI?
A. No.
Q. Have you ever been contacted by the justice department?
A. No. Not to my knowledge.
Q. Did you have any role in preparing Jim Johnston's testimony before congress?
A. No, I didn't have any role in that.
Q. Are you familiar with his testimony?
A. Only the part that I've seen in the press or on TV.
Q. The part that you're familiar with, was it accurate?
MS. FORBES: Objection.
MS. KNISELY: You can answer the

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question.
THE WITNESS: I can't really tell you whether it was accurate or not. It was Mr. Johnston's statement.
BY MS. KNISELY:
Q. To your knowledge, was any work that you did at Reynolds relied upon in preparing Mr. Johnston's testimony before congress?
A. Not to my knowledge. But I've done a lot of work at Reynolds over the years.
Q. Do you smoke?
A. Yes, I do.
Q. For how long have you smoked?
A. Let's see. Probably since I was 15 or 16 years old.
Q. And what brand do you smoke?
A. I smoke Camel Lights.
Q. Camel is also made in a full flavor?
A. Yes, it is.
Q. Is there a particular reason you smoke Camel Lights as opposed to Camel full flavors?
A. I like the taste.
Q. Any reason related to health?
A. For not smoking Camel full flavor?
Q. Yes.
A. No.
Q. And for how long have you been smoking Camel Lights?
A. Let's see. Probably a matter of several months. I did smoke Camel Special Lights before that.
Q. And for how long did you smoke Camel Special Lights?
A. Probably -- it's a little hard to remember. Probably back to around 1990, '91, somewhere in that time frame.
Q. And prior to that time, what brand did you smoke?
A. Premier.
Q. And for how long did you smoke Premier?
A. Oh, exclusively for about three years.
Q. Prior to Premier, what brand did you smoke?
A. It's a little hard to remember. We're going back a long way now. Probably a Camel Light.
Q. Have you always smoked Reynolds brand cigarettes?
A. No, not always.
Q. What other brands have you smoked?
A. Oh, I think that the brand I started with was Fatima.
Q. And who was the manufacturer of Fatima?
A. I have no earthly idea.
Q. What other brands have you smoked?
A. I've smoked Marlboro. I smoked Winston. Those are primary brands. I -- you know, I can't remember 30 years ago exactly what I smoked.
Q. Why was it you changed from Marlboro?
A. Well, to be quite frank, I went to work for R.J. Reynolds Tobacco Company, and while they didn't say I couldn't smoke Marlboros, they sort of frowned when I pulled out a pack.
MS. FORBES: Obviously this portion of the transcript will be marked highly

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confidential, paren, humor.
MS. KNISELY: I was just going to ask that.
BY MS. KNISELY:
Q. Why was it that you changed from Camel Light to Premier?
A. Because I worked on the project. I smoked Premier prototypes for a number of years.
Q. Was there any reason related to health that you smoked Premier?
A. I think it was more of a concern for how the product tasted as it was being developed.
Q. No reason related to health?
A. There might be some relationship.
Q. And what is that relationship?
A. Premier was developed with the objectives of reducing and simplifying the chemistry of cigarette smoke and at reducing the biological activity of cigarette smoke and at reducing ETS.
Of course, we also tried to develop a -- an acceptable product -- that is, consumer acceptable -- so that people would buy it. That was the main thrust.
Q. Would simplifying the chemistry of the smoke have a relationship -- strike that.
What relationship to health would simplifying the chemistry of smoke -- cigarette smoke?
MS. FORBES: Objection to form.
MS. KNISELY: You can answer the question.
MS. FORBES: You can answer.
THE WITNESS: Okay. I can't really comment on health-related issues. I can -- because I'm not a health professional. I'm not a toxicologist. I'm a chemist.
And we have -- R.J. Reynolds has listened over the years to the criticism of other scientists. And when I say simplify the chemistry, that's been a goal of R.J. Reynolds for many years.
We have reduced tar over a long period of time, and we've done so in response to our critics, and we've done so in response to consumer demand. Premier is nothing but an extension of all the work in tar reduction that we've done.
When I say simplify the chemistry, there are a number of components of tar which other scientists have said are problematic. With Premier, we attempted to reduce those compounds.
BY MS. KNISELY:
Q. Was Premier a safer cigarette?
A. Was it a safer cigarette? I can't say that it was a safer cigarette or a safe cigarette, because I don't know how you prove that. And if we can't prove something, we can't say it.
Q. You say that some scientists have said the number of compounds in cigarette smoke are problematic. What did you mean by "problematic"?
A. Problematic from a health standpoint.
Q. How are they problematic from a health standpoint?
A. I can't tell you exactly how they were

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problematic. I know what some of the compounds are from a chemistry standpoint. Tar itself is a compound which has been criticized as having health effects.
Q. What health effects?
A. I don't know. It's been -- of course, the -- well, let me rephrase that.
I'm not a toxicologist and can't talk to you about toxicological or medical things. I can refer you to someone who could. What I can say is that tar has been implicated with disease causation by many scientists --
Q. R.J. -- I'm sorry. I didn't mean to cut you off. Go ahead.
A. Many scientists outside the industry, and the industry, as I said, has worked to reduce tar and chemical constituents thereof for quite a long time.
Premier was a response to the continuing reduction of tar. We had used other techniques to reduce tar and components thereof and had practically run out of things to do to other cigarette products. So, we launched on a new design which would not burn tobacco.
Tar is, of course, formed in the burning process of tobacco. Or I should not say formed. It's a product of burning of tobacco.
Q. What other compounds in cigarette smoke are implicated with disease?
A. There are many.
MS. FORBES: Objection to form.
Go ahead.
BY MS. KNISELY:
Q. And what are they?
A. I can't cite them all for you right now.
Q. Cite as --
A. I can give you some examples.
Q. Please do.
A. Polyaromatic hydrocarbons, nitrosamines, some of the carbonyl compounds.
Q. Any others?
A. Well, there's some 4,000 or so compounds in -- known compounds in cigarette smoke.
Q. And of those 4,000 or so known compounds in cigarette smoke, how many of them are implicated with disease?
A. I really couldn't tell you the answer to that. I don't know.
Q. Has Reynolds studied all of the known compounds in cigarette smoke with regard to their effect on health?
MS. FORBES: Objection.
THE WITNESS: No. We haven't. And I think that would be a rather impossible task.
BY MS. KNISELY:
Q. How many of the known 4,000-plus known compounds in cigarette smoke has Reynolds studied for their effect on health?
MS. FORBES: Objection to the form.
THE WITNESS: I don't really know as to their effect on health.
BY MS. KNISELY:
Q. I'm not asking you for their effect on

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health. I'm asking if Reynolds has studied.
How many of the known compounds in cigarette smoke has Reynolds studied for their effect on health, if any effect?
A. Well, you're asking me for their effect on health.
Q. No, I'm not. I'm asking if Reynolds has studied their effect on health, if they have an effect on health.
MS. FORBES: Same objection.
BY MS. KNISELY:
Q. Do you understand my question?
A. I'm not sure that I do.
Q. Okay. Let me see if I can clarify it.
Of the known compounds in cigarette smoke, how many of those has Reynolds studied to see if those compounds have an effect on health?
MS. FORBES: Objection to the form.
THE WITNESS: I don't really -- I can't speak to how many they have studied for their effect on health, if any. That's really not my field. As I stated earlier, I'm not a toxicologist.
BY MS. KNISELY:
Q. You said tar is -- has been implicated with disease -- strike that.
Polyaromatic hydrocarbons, what diseases have they been implicated with?
A. I really don't know.
Q. Doctor, can you tell me what you've done in preparation for today's deposition?
A. Well, I've met with my attorneys.
Q. And who would those attorneys be?
A. The two attorneys sitting here, plus Mark Holton.
Q. And how many -- again, I -- I will caution you not to tell me any communication that you have had with your counsel. But I will ask you several questions about the number of meetings you've had and the length of those meetings. But again, do not tell me anything -- communication you've had with your counsel.
How many meetings have you had with your counsel in preparation for today's deposition?
A. I believe three or four.
Q. And what were the length of those meetings?
A. Oh, let's see. Probably on the order of three hours apiece.
Q. Other than --
A. Or less.
Q. Other than your counsel, was anyone else present during those meetings?
A. No, I don't remember anyone else. Perhaps Mike Johnson, who's also an attorney, was present for a portion.
Q. Have you talked with anybody else about your deposition here today other than your attorneys?
A. No, I haven't, other than the fact that I was giving one.
Q. Have you reviewed any documents in preparation for your deposition here today?
A. I've basically glanced through part of the Premier monograph yesterday for a couple of hours

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to refresh my memory, since we're talking about something that occurred over a period of, oh, starting 15 years ago or so.
Q. What role, if any, did you play in the drafting of the Premier monograph?
A. I reviewed parts of it.
Q. And what parts did you review?
A. I don't specifically remember what parts I reviewed. The -- the monograph was written by the scientists who carried out the work.
Q. What did your review consist of?
A. Reading.
Q. Did you critique it and make suggestions to the scientists who were authoring it?
A. I don't remember whether I did or not. I suspect I might have. Not in terms of form or in content. It's a rather massive document.
Q. I understand. I want to make sure I got the last answer.
MS. KNISELY: Can you read that back.
(PREVIOUS ANSWER READ BY REPORTER)
BY MS. KNISELY:
Q. When you say not in -- in form or content, do you mean the whole document itself? I'm not sure I understand what you mean by your last answer.
A. I'm saying that I didn't really critique the science when I talk about the form or the content. Scientists who did the various pieces of work were far better qualified than I.
Q. What was it that you did critique then?
MS. FORBES: Objection to the form.
THE WITNESS: I've read it. Read it a number of times.
BY MS. KNISELY:
Q. Have you reviewed anybody else's deposition in preparation for this -- your deposition here?
A. No. I haven't seen another deposition or read it.
Q. Have you reviewed any other documents other than the Premier monograph?
A. I scanned the deposition that I gave in Cooper in 1991.
Q. Have you reviewed any other documents?
A. No.
Q. Have you discussed with any other people at Reynolds the depositions that they have given, either in this case or any other case?
A. Gee, I don't remember that. No, don't remember having done so.
Q. Have you had any discussions with Pat Lippiello about his deposition?
A. Other than that he gave one, no.
Q. Have you had any conversations with Wally Pritchard about the deposition he gave?
A. No.
Q. Have you had any conversations with Don deBethizy about the deposition he gave?
A. No, other than that he told me that he was irritated by part of it.
Q. Did he say in what way he was irritated or what subject he was irritated about?
A. Something about his children, I think, that

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he thought got a little too personal.
Q. Did you speak with William Simmons about the deposition he gave?
A. William Simmons?
Q. Simmons. I'm sorry.
A. Sam Simmons. Sorry. William S. Sam Simmons is what we call him.
Q. Yes.
A. No, I didn't.
Q. Did you speak with John Reynolds about the deposition he gave?
A. No, I didn't.
Q. Did you speak with John Robinson about the deposition he gave?
A. I don't remember speaking with any of these people about it as far as content of what they said for sure. I probably knew that they were giving depositions. It seems like almost all of R & D management is somewhere giving depositions these days.
Q. Did you speak with Gary Burger about any deposition he gave?
A. I knew that he gave one.
Q. Wallace Hayes?
A. No, I haven't spoken to Wally.
Q. Robert DiMarco?
A. No.
Q. Alan Rodgman?
A. No.
Q. Charles Green?
A. No.
Q. You indicated that you'd graduated with your Ph.D. in 1968. Where did you obtain employment after your graduation in '68?
A. R.J. Reynolds Tobacco Company, research and development department.
Q. Was research and development one department at that point in time?
A. Actually I was wrong. It was the research department. They were separate at the time.
Q. How was it that you came to obtain employment with Reynolds Tobacco in 1968?
A. Well, I grew up in High Point. And when I knew I was getting close to finishing my Ph.D., I started looking for employment, which I thought would be highly desirable if I could get it.

And I was home at Christmas, I suppose, in '66 or '67, one of those two times, and I just called, because I had heard R.J. Reynolds had an excellent research and development department. And I called and asked if I could come take a look at it.

So I did. And then I was invited back for a formal interview after that and offered a position.
Q. Who did you interview with?
A. I remember talking with Murray Senkus who was -- I guess he was director of research at that time. Claude Teague.
Q. Anyone else you interviewed with?
A. I'm sure there were several people that I talked to.
Q. What position did Claude Teague hold at that

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time?
A. At that time, I'm not exactly sure. He became manager of the chemical division of the research department, and I'm not sure whether he was in that position when I interviewed with him or not.
Q. What position did you first have at Reynolds in 1968?
A. I believe I entered as a senior R & D chemist.
Q. Senior R & D chemist?
A. Yes. Or senior research chemist.
Q. Research chemist.
A. I mean, we've changed titles so many times over the period of 30 years that I can't keep track of them.
Q. It's hard for us to keep track of them too.
Which -- strike that.
Who was your immediate supervisor when you first started at Reynolds Tobacco?
A. I believe it was Ed Bernasek.
Q. And what position, if you recall, did he hold at that time?
A. He was -- and this is -- this is stretching my memory, but he was, I believe, a section head, is what we called them then.
Q. Of -- of what division in research?
A. I don't remember what the exact name of that group was. It could have been the carbohydrate group or the starch group. It was -- probably the informal name was the starch group.
Q. And for how long were you a senior research chemist reporting to Ed Bernasek?
A. I don't remember the exact length of time.
Q. As best as you can recall.
A. Probably a couple of years, but I really can't recall exactly.
Q. What was the next position you held at Reynolds Tobacco after senior research chemist?
A. I was a group leader.
Q. A group leader in what?
A. I don't remember -- it was in the chemical division. But I don't remember exactly what the group was called. May have been called -- had something to do with essential oil group, perhaps.
Q. Was the change in position from senior research chemist to group leader a promotion?
A. I believe it was, yes.
Q. What were your duties as a senior research chemist?
A. From when to when?
Q. During your time as a senior research chemist. You can tell me if -- if your duties changed during that time.
A. They did. Specific subject areas changed. I'm not sure that the title changed or exactly when that was.
Q. What were the specific subjects that you worked on during your time as a senior research chemist?
A. Well, when I entered the company, I worked in the, as I said, starch group, or whatever we called it. We owned Pennik & Ford, which was an

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industrial starch company. And that group worked on developing modified starch products. And we did that for the period of time probably up until around 1970, I believe.

And Reynolds divested Pennik & Ford. And I think that was over antitrust or some grounds that I didn't understand. But at any rate, we sold Pennik & Ford.

Q. You said that "we" did this work up until 1970. Did you mean Reynolds Tobacco or yourself personally?

A. I did some of it personally. I was in a group of several people that worked in the same area, as I said, the so-called starch group. And again, my memory may not be perfect, because we're talking about nearly 30 years ago.

Q. What were the modified starch products that you were developing? What were they used for?

A. I'm not sure that they were ever commercialized. Starch was a commodity material and it was cheap. We were looking to develop other derivatives of starch through chemical reactions with starch, of things like -- I'll quote one -- benzyl starch, which might have properties that would make the starch products worth more money than just starch itself.

Q. Was the work that you did in the starch group in any way related to Reynolds Tobacco's cigarette products?

A. No, it wasn't. It was a subsidiary, as I said, that we had acquired during diversification before I ever came to the company.

Q. During your time as a senior research chemist, you only worked on -- on the starch -- different projects in the starch area?

A. No, that's not exactly true. As I said, we divested the starch company. And before that happened -- I mentioned this benzyl starch. One of the things that we had to know in the reaction to form benzyl starch was how much unreacted reactant called benzyl alcohol was still present in the mixture.

In order to determine that, I started developing some methodology to do so. And that involved gas chromatography in order to measure the benzyl starch residue. I got very interested in gas chromatography as a result, and that was coincident with the end of the work that we did with Pennik & Ford, or for Pennik & Ford. And I moved into an area where I really began to pursue gas chromatography.

Q. And what area was that?

A. That's -- I think I referred to it earlier as the essential oil group. But I was still a senior research chemist at that point in time.

Q. And what did the essential oil group do?

A. We used -- we developed, first of all, high resolution glass capillary gas chromatography and gas chromatography mass spectroscopy. Glass capillary columns were not available in the United States at the time, and we had to develop and coat our own.

We used this technology, which was very

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high-power separation technology, that is, to separate various chemical entities. And we looked at essential oils of plants. I worked on clarey sage. By the way, that's another of my publications that I had forgotten about.
Q. I'm sorry. What was the name of it? Clar --
A. Clarey sage essential oils. C-L-A-R-Y, I believe, or maybe E-Y, one of the two. That work was done and published with Jack Leffingwell, who was a cohort at the time.
Q. For how long did you work in the essential oils group?
A. Well, I continued to work in the essential oils group for some time after the clarey sage that I talked about. We also looked at a number of other things, including tobacco essential oils.
Q. And for how long did you work in the essential oils group?
A. I believe up until about probably '76 to '78, somewhere in that range.
Q. I'm sorry. You said '76 to '78?
A. I said somewhere in that range. I'm not sure of the exact timing.
Is this a good time to take a break?
MS. FORBES: Yes.
MS. KNISELY: Sure, we can do that. That's fine.
VIDEOGRAPHER: Off record at 9:49.
(BRIEF RECESS)
VIDEOGRAPHER: We're back on record at 10:04.
BY MS. KNISELY:
Q. Doctor, when we took a break, we were talking about your employment as group leader in the chemical division with regard to essential oils.
You had indicated that while you were in the essential oils group, that you had studied some of the essential oils in tobacco; is that correct?
A. That's correct.
Q. What essential oils in tobacco were you studying?
A. We started with the flue-cured essential oil, I believe. And we looked at -- one of my papers is on essential oil constituents identification and -- identification and, what, quantitation, I suppose, or semi-quantitation of various constituents in tobacco essential oils. We're trying to identify compounds that were present.
Q. And how many different essential oils in tobacco did you study?
A. Well, actually, when we talk about the essential oil of tobacco, there is --
Q. One oil --
A. There's one oil. And it has many components in it.
Q. How many components?
A. Oh, gee, I don't know. We identified as -- in one of the papers I published, I think we identified or isolated some 300 components.
Q. Have all of the essential oils in -- or excuse -- strike that.
Have all the components of the tobacco essential oil been identified today?

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A. No. No, they haven't. There are some compounds that resist identification. We don't know what they are, obviously, if they're not identified.

And the -- the means that we're using gas chromatography was only -- only amenable to volatile compounds or semi-volatile compounds. Many compounds can't be identified by that technique.

Q. Were attempts made to identify components of tobacco essential oils through other means?

A. Well, we had a whole program to look at -- we, being R.J. Reynolds research, had a whole program that looked at isolation and identification of various tobacco components, and that spanned a number of years. This was a part of that program.

We were looking for flavorful components that might be used to increase the goodness or good flavor of poor quality tobaccos.

Q. During this time in essential oils, did you ever have occasion to work with nicotine?

A. You really can't work on tobacco without working with nicotine. Usually, for a chromatographer, nicotine is in the way, because you want to look at other components which are present, and nicotine's mundane.

Q. Why is it mundane?

A. Well, it's mundane in terms of people have known it was there for a long, long time and it's a big constituent. And really, we were interested in components which contributed other flavors other than the flavor of nicotine. That was well-known. And we were looking for new things, new flavor substances, as I said, that might enhance other tobaccos. And nicotine was in the way.

Another compound called solanone is in the way as well. It's another large component. I say large. I mean, if you do a gas chromatography experiment and you have a strip chart recorder and the peaks are coming off, what you want to do is separate them. And you're looking at peaks that are very narrow as well as a nicotine peak, which might be this broad, and a solanone peak which is this broad, and a solvent peak, which is also broad and covers up a lot of the things that we were really looking for.

Q. How big a constituent in tobacco is nicotine -- I'm sorry. Strike that.

How big a constituent in cigarette smoke is nicotine?

MS. FORBES: Objection to the form.

MS. KNISELY: You can answer the question.

THE WITNESS: Can you rephrase the question?

MS. KNISELY: Sure.

BY MS. KNISELY:

Q. How -- what is the largest component or compound in cigarette smoke?

A. I think that the most prevalent compounds in cigarette smoke are some of the gas phase constituents, such as carbon dioxide, nitrogen, carbon monoxide. I think they account really for

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the largest part en masse of cigarette smoke.
Q. What's the next largest?
A. Geez, I don't know. Nicotine is -- is certainly up there with some of the larger components. I don't think it's the predominant component in cigarette smoke.
Q. Did you ever study -- actually study nicotine during your time in the essential oils division? I know you said you were looking to get it out of the way. Did you ever actually study nicotine?
A. As part of this work I did in the essential oils group, I don't think I did study nicotine specifically.
As I said, we were looking for flavor compounds, and they were generally of lower abundance, because some are quite impactful. Just a little bit of certain compound contributes a lot to taste and odor.
Q. For how -- I'm sorry. I didn't mean to cut you off.
A. I'm sorry. I said, and odor.
Q. For how long did Reynolds Tobacco Company know that nicotine was a big constituent in tobacco?
MS. FORBES: Objection to the form.
THE WITNESS: I couldn't tell you the answer to that question, because it predates my employment there, I'm sure. Nicotine is a naturally occurring part of tobacco.
BY MS. KNISELY:
Q. What was your next position you held after group leader in the chemical division?
A. I believe that it was group leader in the -- I believe that group was called the tobacco group.
Q. Was it a change from group leader in the chemical division to group leader in the tobacco group?
A. Well, they were both parts of the chemical division. It was another, I guess, section, is the way it was referred to in those days.
Q. So a change from the essential oils group in the chemical division to group leader in the -- in the tobacco group of the chemical division, was that a promotion?
A. I think that was a lateral move.
Q. And the reason for the move?
A. I don't remember them exactly telling me what the reason for the move was. I had worked in the essential oil group with applications of essential oils, or application of chromatography to essential oils. And this was a more -- a more applied research area, not quite as fundamental as the previous essential oil work had been.
Q. For how long were you at the tobacco group?
A. About two years.
Q. Did you supervise any people as group leader in the tobacco group?
A. Yes --
Q. How many --
A. -- I did.
Q. How many people did you supervise?
A. I -- to tell you the truth, I can't remember.

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Probably somewhere between five and ten.
Q. What positions did the people that you supervised hold?
A. I've got no clue. Anywhere from technician to senior R & D chemist, probably.
Q. What was the purpose of the tobacco group?
A. We worked on various applications of tobacco.
Q. What do you mean by "various applications of tobacco"?
A. There was a lot of work done looking at grades, various grades of tobacco and various tobacco blending techniques. There was work done in -- let's see -- amino sugar reactions which occur in tobacco and tobacco smoke. There was some isolation of particular tobacco components and some synthesis of tobacco components.
Q. You said worked on looking at tobacco grades and tobacco blending techniques. Could you be more specific what the work was?
A. Well, we had -- we had the capability to make various different blends with various different grades of tobacco. We had the capability and used it to make test cigarettes which we might smoke on internal smoking panels. We had small making capability, lab-top cigarette makers. And we made products and we changed blends, and we smoked the products to see how they did in terms of our panels.

We had paneling -- cigarette paneling capability as a part of the tobacco section who actually smoked the cigarettes -- or ran the panels and smoked the cigarettes, or we brought people in to smoke cigarettes from other parts of the department, and to rate those cigarettes on various parameters.
Q. And what were the parameters that they rated the cigarettes on?
A. Jesus. Overall acceptability, for one. We had a panel that looked just at acceptability. We had panels that looked at just attributes, like harshness, smoothness. I can't remember what all the various attributes were. Strength. But various attributes of taste. And rated those on some scale or other.
Q. What was meant by the term "acceptability"?
A. How well people liked it. Overall liking, I suppose.
Q. And the persons who served on these cigarette panels were research and development people at Reynolds?
A. This was in their research department when they were still separate. Most of them were just regular employees. And it would depend on what we were really looking for.

If we wanted to know acceptance, or liking, we generally used untrained panelists. If we wanted to know more about particular taste characteristics, we used some expert panels, or -- or trained panels.
Q. For how long were you in the tobacco group -- strike that. I've already asked that.

For the time that you were in the tobacco group, did these panels continue for the

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entire time you were in the tobacco group?
A. I believe so.
Q. Did you --
A. I didn't actually run the panels. Someone else in the tobacco section ran the panels.
Q. Who ran the panels in the tobacco section?
A. Gosh, let me see. It's a long time ago. I'm not sure exactly who ran the panels.
Q. When you talk about you had the capability and you did different blendings of tobacco, what criteria would you use to blend the tobacco?
A. Well, I think that what we were looking for was mixing of different grades of flue-cured tobacco, or flue-cured and burley, or flue-cured burley Turkish reconstituted whatever, and looking for what were the effects on taste and consumer acceptance.
Q. Did the content of nicotine contained within the various grades and blends play any role in the blending process?
A. I don't think it was tremendously important. We would have measured it to see what it was, as the final blend was made.
Q. When you say it was not tremendously important, did it have any significance at all?
A. Well, nicotine content has significance as far as taste is concerned. It gets into harshness terms, smoothness terms.
Q. Has Reynolds ever attempted to control the level of nicotine in its cigarette products?
A. That's a broad question.
Q. It's a yes or a no question.
A. What do you mean exactly by that? Can you clarify it a little more for me?
Q. Has Reynolds Tobacco ever controlled nicotine -- the level of nicotine contained in its cigarette products?
MS. FORBES: Objection. The witness asked for clarification. Can you provide it?
MS. KNISELY: Do you understand the question?
THE WITNESS: As I said, it's rather broad. What do you mean by that? Do you mean did we research nicotine levels? Did we control the nicotine in -- you know, what exactly do you mean? I'm not sure I know.
BY MS. KNISELY:
Q. I'm not asking about research. I'm asking about: Did Reynolds ever control the level of nicotine in their cigarette products --
MS. FORBES: Objection --
BY MS. KNISELY:
Q. -- through any means at all?
MS. FORBES: Objection.
The witness has asked you for clarification. Maybe you could provide it to him.
BY MS. KNISELY:
Q. Has Reynolds ever studied the means by which to control nicotine in cigarette products?
MS. FORBES: Same objection.
THE WITNESS: As I said, we've

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certainly done research in nicotine.
As far as work to control the levels in commercial brands, if that's what you're referring to -- and I'm not totally sure what you're referring to -- no, I don't think so.
As I said, we have done a lot of research on nicotine, as we have on other components, such as menthol, moisture.
BY MS. KNISELY:
Q. Let me see if I can be more specific.
Does Reynolds Tobacco control the nicotine in the Camel Light -- the level of nicotine in the Camel Lights that you smoke?
MS. FORBES: Objection.
THE WITNESS: Not other than in blending. Various different tobaccos have various levels of nicotine. It's an agricultural product. And the level of nicotine in the various tobaccos is dependent -- my understanding is that it's dependent on crop conditions, whether it's a dry or wet summer, whether the -- the region -- and that's the raw material that we have to work with.
We would like the nicotine in tobacco products that we sell to be as consistent as it can be. But we have to work with the raw materials that are there, like everybody else. And again, I'm speaking from my knowledge as a chemist, not from knowledge as an expert blender or as a manufacturing person.
BY MS. KNISELY:
Q. So, to your knowledge, the only way Reynolds Tobacco controls nicotine in their products is through blending of the various tobacco?
MS. FORBES: Objection. Objection to the form.
MS. KNISELY: You can answer the question.
THE WITNESS: Well, to my knowledge, that's the only way they do it.
BY MS. KNISELY:
Q. You indicated that the tobacco group also does work on tobacco and tobacco smoke. Can you be more specific in that, or when you were referring to that, is that the other things we've already talked about?
MS. FORBES: Objection to the form. You may answer.
THE WITNESS: Can you clarify a little more the tobacco?
MS. KNISELY: Sure. Absolutely.
THE WITNESS: Go ahead, please.
BY MS. KNISELY:
Q. When I asked you what the tobacco group's purpose was, you listed a number of things. One of those things was they worked on tobacco and tobacco smoke. What did you mean by that?
A. Well, they were the tobacco group, so they worked more on tobacco.
Q. What --
A. They worked on tobacco and tobacco blending. And we're talking -- for point of clarification, I think it was the tobacco section. And there was

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more than one group in the tobacco section. I don't know whether I made that clear or not.
Q. You had indicated tobacco group. There was --
A. I --
Q. There was a tobacco section that had various groups underneath it?
A. Right. And you're going to ask me what are the names of those groups, and I'm not going to be able to tell you, because I don't remember that well.
Q. Which of the groups did you work in as group leader in the tobacco section?
A. I think at one time I had the panels, smoke panels. I had some people who were looking at tobacco moisture content and its impact on tobacco smoke and consumer acceptance.

And this job and my next job will overlap somewhat when we talk about it. There was some work done as to menthol optimization. There was some work done in terms of -- I think it was called nicotine optimization. We worked on a number of different parameters that would effect consumer acceptance.

And I'm saying we. I'm saying people that were in my group or in other areas of the so-called tobacco section. It's hard for me to keep these things straight, because now we would have called those things divisions --
Q. Divisions.
A. -- rather than sections.
Q. You said you worked on parameters affecting consumer acceptance. Were one of those nicotine optimization?
A. That's right.
Q. What do you mean by "nicotine optimization"?
A. The person who did that work I don't believe reported to me in the beginning but reported to me in the course of that work. He was looking at various ways to blend tobaccos to get different nicotine contents.

And he was doing this using, I think, response surface methodology, where you set up a surface -- statistical thing, which I'm not -- I can't really explain too well. But you try to hit different nicotine levels in the tobacco by blending various grades of tobacco together.

Then you have -- and I don't remember whether it was internal smokers or external smokers smoke the products and rate them as to taste, acceptance, harshness, smoothness, other terms, strength, and you see which ones they like best, basically.

This work was partly driven by the fact that Marlboro seemed to have a lower level of nicotine than Winston at that particular time. And we're talking full flavor now, Marlboro full flavor and Winston full flavor.
Q. Uh-huh.
A. It was also a cigarette that was growing rather rapidly in that time frame. And we were interested in knowing what made it more acceptable than ours.

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One of the things we knew was that their tobacco -- that is, the percent tobacco in their products -- I'm sorry -- the percent nicotine in their tobaccos, the Marlboro tobaccos and the Marlboro cigarette, was lower than ours on average.

We also knew that that product seemed to be a smoother, less harsh product than others, as described by consumers and panelists. And we wanted to know for various different consumer groups -- such as full flavor smokers, light smokers, ultralight smokers -- what was the most acceptable level for those consumers, by group, and what the attributes were that were affected by changing nicotine content or, as I said, other parameters such as moisture content, menthol content. And there may have been other areas that we looked at, but I remember those.

Q. In response to this work, did R.J. Reynolds Tobacco lower the nicotine content of its cigarette products?

A. You know, I don't know that -- whether they did or not. I really don't think they did.

One of the problems in doing something like an RSM design where you want to hit and test various nicotine contents is you sometimes have to use odd types of tobacco, tobacco which will -- can be blended -- or tobaccos which can be blended to give you a specific nicotine content in an experimental design but can't be used commercially because the taste of the product is not good.

Q. But it was possible during this time to pick a nicotine content level and hit that level through blending of tobacco?

A. No. I said we had problems doing that. Sometimes we could hit the points that we wanted. Sometime -- and this is into experimental design. And I'm not a statistician, but I know you set up where your design range -- you want it to be, and then you try to make products which hit those specific points.

Many times we had trouble hitting the specific points that we wanted to hit. We came close, but it wasn't easy. And to do so, we had to use, as I said, tobaccos which we would not normally have used and might not be available in quantity to ever commercialize. Plus the fact that the taste was not that good.

Q. Other than blending of tobaccos, are there other components of cigarette -- cigarette design or construction that you're aware of that can affect the level of nicotine?

A. Can you be more specific? Do you mean -- I'm talking about how much nicotine is in the tobacco and how much effect that has on the nicotine delivery. Now, which piece are you really talking about, delivery from the smoke or to the smoker?

Q. I'm talking about, for example, a variable in the cigarette would be a filter. Has Reynolds studied how various filters affect the nicotine delivery?

MS. FORBES: Objection. Lack of foundation.

THE WITNESS: Can you be a little

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more specific? Obviously, we've researched filters and their impact on tar and nicotine.
BY MS. KNISELY:
Q. Well, why don't -- why don't we go back this way, and we'll build up to it. Counsel's right. We'll build up to it.
You mentioned a term, "nicotine delivery." What's your understanding of that term?
A. Nicotine delivery is -- I'm speaking of, it is FTC-measured nicotine in smoke.
Q. Is the FTC method of measuring nicotine in smoke an accurate measure of the actual level of nicotine in smoke?
MS. FORBES: Objection to the form.
THE WITNESS: Can you be a little more specific, clarify for me a bit what you mean.
BY MS. KNISELY:
Q. You indicated that FT -- that nicotine delivery --
MS. KNISELY: Read back the answer to the last question, if you would.
(PREVIOUS ANSWER READ BY REPORTER)
BY MS. KNISELY:
Q. Is the FTC measurement or the measurement of nicotine in smoke using the FTC method an accurate method of measuring the true level of nicotine in smoke?
MS. FORBES: Objection to the form.
THE WITNESS: The FTC method of measurement in nicotine in smoke is a measurement -- a standard measurement, adopted with the agreement of the FTC by the industry, because there was no standardized way of measuring nicotine in smoke or tar in smoke at one point in time. And it's a measurement of tar and nicotine together that the FTC measurement represents.
It's a way to rank cigarettes in terms of delivery of tar and delivery of nicotine under a specific set of conditions which has been agreed to as standard by the FTC and the industry.
Does that help?
BY MS. KNISELY:
Q. That defines for me what the method -- the FTC method is and what it measures. But does it accurately measure the nicotine in smoke?
MS. FORBES: Same objection.
THE WITNESS: The term "accurately" -- the term "accurately," yes, it measures accurately, if accurately -- accurately in my mind means: How much is it? Yeah, it measures how much it is under that specific set of conditions.
BY MS. KNISELY:
Q. Has Reynolds ever submitted to the FTC any -- strike that.
Has Reynolds ever submitted any documents to the FTC advising the FTC that they believe that the FTC method of measuring nicotine in smoke to be inaccurate in any way?
MS. FORBES: Objection to the form.
THE WITNESS: I don't know exactly how you're using the term "inaccurate" or

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"accurate." I said that the FTC method, as far as I know, is accurate in terms of the measurement of nicotine that is present in smoke at those specific conditions.
BY MS. KNISELY:
Q. Has Reynolds Tobacco ever submitted any documents to the FTC with regard to the FTC method for determining nicotine levels in smoke?
MS. FORBES: Objection to the form.
THE WITNESS: I don't know what documents Reynolds may or may not have submitted to the FTC.
I'm trying to speak for myself, to the best of my understanding, of what Reynolds has done. That may not be totally and completely accurate, because I don't know everything that Reynolds has done.
MS. FORBES: Dr. Lloyd, you're not required to know. You can -- she only wants you to testify from your personal knowledge, and that's all you're bound to do.
THE WITNESS: That's what I'm doing.
MS. FORBES: And you're not responsible for knowing FTC filings as an organic chemist.
MS. KNISELY: But if you do know them, we're certainly in need of hearing about them.
BY MS. KNISELY:
Q. Doctor, you used the word "nicotine optimization." And I apologize. I didn't ask this earlier, I don't believe. What do you mean by nicotine optimization?
A. Nicotine optimization is the studies I was just describing which were RSM experimental studies where we looked at various levels of nicotine and consumer acceptance, or consumer smoke descriptors, such as harshness, flavor, strength, mildness, smoothness, and so on.
We looked at what were the optimum levels of nicotine, as I have previously said, for full flavor smokers, light smokers, and ultralight smokers, because different groups have different preferences --
Q. What are --
A. -- in terms of nicotine content or flavor content. And that's the way -- that's why we sell all those groups of compounds -- excuse me -- group different smoking groups, because there are different preferences in the marketplace.
The work that was done was aimed at looking at and optimizing consumer -- optimizing consumer acceptance in the various different groups in terms of nicotine, other studies relative to moisture, relative to menthol, for those same smoking groups, or same categories of smoking groups.
Q. Doctor, did that nicotine optimization or the -- strike that.
Did the study of the nicotine optimization that you've been talking about predate your involvement with the tobacco section?

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A. I believe it started before I was involved --
Q. Do you know --
A. -- in that group.
Q. Do you know when it started?
A. I don't really. I can guess. Probably would be around sometime in the early '70s. I'm sorry. That's not right. It was probably in the mid to late '70s, because I only became a member of that tobacco group in '78, I believe, and the work had already started by that time.
Q. Does that work continue today?
A. Specifically, optimizing those parameters, no, I don't think so.
Q. When --
A. We continue to develop products, new products. We continue to look at various different cigarette parameters to improve consumer acceptance of all of our brands.

But as far as I know, there are no studies of nicotine or nicotine optimization going on at this point. I can't tell you there are absolutely not, but I can tell you that I don't know of any.
Q. Do you know when those nicotine optimization studies stopped?
A. I don't remember exactly when they stopped. They would have been sometime in the -- we probably completed full flavor, lights, full flavor low tar, FFLT, lights, whatever you want to call them, and ultralights, nonmenthol studies in the -- sometime in the '80 to '82 time frame. And again, it's a long time ago on those dates. That may not be exact. But that's to the best of my memory when they were done.
Q. Doctor, you said you also studied other cigarette parameters to improve consumer acceptance of cigarettes. What other cigarette parameters were studied by Reynolds?
A. Well, we looked at menthol, and, again, menthol optimization -- that is, what is the best level for menthol in terms of consumer acceptance, for full flavor menthols, for lights menthols. And I don't remember whether we did ultralight menthols or not.

But, again, the question was the same, is: What is the optimum level for menthol, for full flavor menthol smokers, as you can classify them as a group? And that's somewhat -- that's buyers of full flavor, is what I'm trying to say, or buyers of lights.

We also looked at moisture at the same time.
Q. Any other parameters?
A. We also looked at cigarette shelf life as -- and I'm getting into the job -- as I said, some of the work we did overlapped the '78 to '80 time frame and the '80 and later.
Q. Uh-huh.
A. -- time frame. We did shelf life studies --
Q. Uh-huh.
A. -- where we tried to determine a shelf life policy for how long our products ought to stay on the shelf.

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Q. Any other parameters you looked at?
A. None come to mind immediately. There may be some others.
Q. When you were looking at moisture, did you look at the effect of moisture with regard to its effect on nicotine delivery?
A. To some extent. And that's because as we also were looking at that in terms of the -- well, you said moisture.

But in terms of shelf life. I'm sorry. One of the things that happens when cigarettes are stored in hot, dry regions is that they dry out. And the lower the moisture, the harsher the product. So, we were interested in that.

Obviously, if you raise the nicotine or if the nicotine -- if the nicotine delivery is higher in low-moisture cigarettes, then those cigarettes are more harsh. At least that's one theory of what causes harshness to go up.

Harshness is not a desirable consumer parameter. It reduces acceptance when the level of moisture is too low in the product. And that's why both the moisture optimization study and the shelf life study were done. We weren't so interested in nicotine content specifically in that study, but in what the consumer parameters were. And I'm trying to equate here some of the why that we'd be interested in nicotine at all in that study.
Q. You also said as part of your work with the tobacco section that that work involved synthesis of tobacco components and reactions of tobacco components; is that correct?
A. Generally so, yes.
Q. What work did that involve?
A. I can give you some -- a specific example. The work was actually done in another group within the tobacco section, not my group. But one of the things of interest was the reaction of sugars with amino acids and what -- which occur during curing of tobacco or later and what effects those things had on consumer taste.

Again, when I say consumer taste or acceptability, I'm talking about the various parameters, such as flavor, taste, harshness, smoothness, and so on.

The synthesis that I remember specifically was a reaction between proline, which is an amino acid, and sugar, and I can't -- I think it was fructose, a specific sugar called fructose, to form a compound called prolino fructose.

We were interested because certain tobaccos had high levels of the amino acid proline, and also some of the casing materials that we used would be -- would contain fructose. And we wanted to synthesize that particular amino sugar and test it to see what effects it had on taste.
Q. You've been talking about taste. Can you define taste for me, how you view the components of taste?
A. I wish I could. Taste is not well understood, and I'm certainly not a physiologist. I can't get technical with you. I can only be general in what I know about it.

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Q. If you can tell me what you know about it.
A. Okay. Taste is the -- to me, my definition, is it's the total sensation that you get when you as a smoker take smoke into your mouth and inhale it. It's the -- I could call it sensory, but that's a very broad term. It's the experience that you as the smoker have of sensation in your mouth, of tactile feeling in your mouth, of sting on your tongue, or irritation to your throat, a certain amount of which smokers seem to want. And I as a smoker want.

When some of those sensations are higher than you want, they become unpleasant to the smoker, and that's what we call harshness. Harshness, smoothness, flavor, all those parts of the smoking experience I would classify in the broad area of taste, again, as one man's definition.

I might also -- excuse me. I might have to have some water in a minute.

But also, let me include in that the feel, the body -- and use the term "body" -- we use the term "body" a lot in describing tobacco smoke, because it's really not easy to describe.

Q. Uh-huh.
A. Body is a sense of fullness in the mouth or fullness in the chest. You might call that chest impact for better -- lack of a better word.

Thank you, sir.

Q. And that's all part of your definition of taste?
A. Right. It's a very broad definition. And everyone you would find wouldn't agree with my definition, even within Reynolds Tobacco. But that's the best understanding that I have of it and the best explanation I can give you.
Q. Does nicotine have a good taste?
A. Does it have a good taste?
Q. Yeah.
A. It's an important component of the overall taste sensation. And it's my understanding that that's part of what has the irritant impact that I was talking about and the body and fullness, that nicotine's partially responsible for those things.

Does it have a real taste? I don't know that cigarette smoke has a real taste. That's why I was describing it in the broad terms that I was and trying to break out its various components.

I've smoked cigarettes which didn't have nicotine. Philip Morris introduced a product in the test market called Next which either had -- well, basically, no nicotine. And I didn't find that product to be what I would want in terms of the body of the smoke, the -- it was a very bland smoke. It was obviously missing something in terms of overall taste as I've defined it. And to me it wasn't very acceptable. And to consumers it didn't seem to be very acceptable either. The product failed in test market.

MS. FORBES: Sherrice, we've been going about an hour. If this is a good time, I'd like to take a quick break.

MS. KNISELY: That's fine if you

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want to take a quick break.
VIDEOGRAPHER: Off record at 10:55.
(BRIEF RECESS)
VIDEOGRAPHER: We're back on record at 11:07.
BY MS. KNISELY:
Q. Doctor, have you ever tried to stop smoking?
MS. FORBES: Objection to the form.
THE WITNESS: I have stopped smoking in the past.
BY MS. KNISELY:
Q. And when have you stopped?
A. I don't remember exactly when it was. It was probably in the early '70s.
Q. And for what period of time did you stop?
A. I can't tell you exactly. It was probably six or seven months.
Q. Is that the only time that you have stopped smoking?
A. I believe it is.
Q. Have you attempted to quit previously and been unsuccessful?
A. No.
Q. What prompted you to stop smoking in the early '70s?
A. My doctor advised me to stop.
Q. And why did he advise you to stop?
A. I think he advised everyone to stop.
Q. Do you know -- did he tell you why he suggested you stop?
A. I have allergies, and he suggested to me that it would probably be better if I didn't smoke.
Q. Did he give any other reason for his advice to you to stop smoking?
A. I don't remember that he did.
Q. Has any doctor at any other point in time ever advised you to stop smoking?
A. I'm sure they have.
Q. Did they tell you why they advised you to stop smoking?
A. They said for particularly someone who has allergies, that probably shouldn't.
Q. Any other health reasons the doctors advised you not to smoke?
A. I think they enumerated the -- the normal risks that are associated with smoking or the normal well-known diseases which have been linked or associated with smoking.
Q. And what are those diseases?
A. Well, I'm not a medical person nor an epidemiologist, but I think that going far back in time, that some diseases are well-known to be associated with smoking.
Q. And what are those well-known diseases?
A. Well, I'd say cancer is one. Heart disease is another. Emphysema is another. I mean, cigarettes were called coffin nails, or cancer sticks, back in -- as early as the '20's, I believe, predating me, for sure.
Q. Was there a particular reason why you chose not to abide by your doctor's advice to stop smoking?
MS. FORBES: Objection to the form.

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THE WITNESS: Was there a particular reason why I chose not to abide by it?
MS. KNISELY: Yes.
THE WITNESS: I did stop smoking for a while. But I found that I missed smoking. I enjoyed smoking. I enjoy the ritual.
BY MS. KNISELY:
Q. The time you stopped smoking, can you tell me, did you seek any assistance in order to stop smoking?
A. No.
Q. How did you stop smoking?
A. It's very simple.
Q. And what was that?
A. I stopped lighting them up.
Q. You -- one day you smoked; the next day you didn't.
A. That's right. And how else would you do it?
Q. During that six to seven months that you didn't smoke during the early '70s, did you have any cravings for cigarettes?
A. As I said, I missed smoking. I missed the ritual. I missed having something to hold in my hand. I missed the taste, as I have broadly defined it.
Q. Did you find yourself more irritable?
A. I was probably pretty irritable the first couple of days. Some people say I'm irritable anyway.
Q. Any other change in behavior that you experienced when you stopped smoking?
MS. FORBES: Objection to the form.
MS. KNISELY: You can answer the question.
THE WITNESS: I don't remember anything specific.
BY MS. KNISELY:
Q. Does your son smoke?
A. No, he does not.
Q. Has he ever smoked?
A. Not to my knowledge.
Q. Have you ever discussed with him smoking?
A. Yes, we've discussed it at times. He's never -- I -- he's never had any propensity to do so, so it didn't require a lot of discussion.
Q. When you discussed smoking with your son, did you discuss the health effects of smoking with your son?
MS. FORBES: Objection to the form.
MS. KNISELY: Let me rephrase it.
BY MS. KNISELY:
Q. Did you discuss with your son at any time the normal risks associated with smoking as you understood them?
A. I advised him, I think, on an occasion or two, that I would prefer if he did not smoke because of the well-known statistical associations, and that it was a habit that he didn't have to take up, and indeed showed no interest in ever taking up, nor does he now.
Q. You view cigarette smoking as a habit?
A. Yes.
Q. Is -- is it addicting?

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A. I'm not really an expert in addiction. I could refer you to John Robinson who is a psychophysiologist, I believe, or he's a psycho-something-ologist. I'm not sure what. But addiction is his field, and it's not mine.
Q. Do you believe yourself to be addicted to cigarettes?
A. I enjoy smoking.
Q. Do you believe yourself to be addicted to cigarettes?
A. I've told you I'm not --
MS. FORBES: Objection. Asked and answered.
THE WITNESS: I don't know what addiction means. It's in the definition of the term.
BY MS. KNISELY:
Q. Do you have any understanding of the term "addiction"?
MS. FORBES: Objection to the form.
BY MS. KNISELY:
Q. Doctor, you've heard the term "addiction" before, have you not?
A. Certainly I've heard it.
Q. What is your understanding of the term "addiction"?
A. I told you, I have no expertise in that area and referred you to John Robinson who can answer your questions.
Q. Do you have any understanding at all as to the term "addiction"?
A. My only understanding is -- my specific understanding is that it's in how the word is defined, and I'm not expert in that area.
Q. How do you personally define the word "addiction"?
A. I think of it in terms of drug addiction, in terms of being hooked on something like cocaine or heroin, which is hard or impossible to quit. That's my personal view.
Q. Do you think under your personal definition that you're addicted to cigarette smoking?
A. Well, as I said before, I can't speak technically about addiction for myself --
Q. No --
MS. FORBES: Let him finish, please.
THE WITNESS: I don't think so. I quit.
BY MS. KNISELY:
Q. Is nicotine a drug?
A. Again, I would say I'm not a pharmacologist. I don't know about specific definition of drugs.
Q. When you gave me your personal definition of addiction, you used the term "drug addiction." What's your understanding of the term "drug"?
MS. FORBES: Objection. Asked and answered.
BY MS. KNISELY:
Q. What's your personal understanding of the term "drug"?
A. I thought I understood -- answered that a minute ago.

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MS. KNISELY: Could you read back the answer to the question, "Is nicotine a drug?".

(PREVIOUS ANSWER READ BY REPORTER AS FOLLOWS:

Again, I would say I'm not a pharmacologist. I don't know about specific definition of drugs.)

BY MS. KNISELY:

Q. When you used the term "drug addiction," what did you mean by the term "drug" and the word "drug" in your phrase "drug addiction"?

A. I think I was talking about the popular way that that term is used, and I cited cocaine and heroin, I believe.

Q. You say the popular way the term is used. I'm not sure I understand that phrase, when you say popular way the term is used.

A. Well, I hear it on TV.

Q. Have you ever discussed at Reynolds with anyone at Reynolds whether nicotine is a drug?

A. I don't know. It's possible that I have, possible that I haven't.

Q. When the FDA issued regulations finding that nicotine is a drug, did you have any conversations with anyone at Reynolds regarding that?

A. When specifically are you speaking of and what regulations are you talking about?

Q. When the FDA issued its regulations that nicotine was a -- classified nicotine as a drug, did you have any discussions with anyone at Reynolds at that time?

MS. FORBES: Objection to the form.

MS. KNISELY: I'll rephrase it.

BY MS. KNISELY:

Q. Doctor, are you aware that the FDA has classified nicotine as a drug?

A. Yes, I'm aware of that.

Q. And when did you become aware of that?

A. I'm sure not too long after they said so.

Q. And when was that?

A. I don't know.

Q. How did the learn that the FDA classified nicotine as a drug?

A. I don't remember that either.

Q. Did you have any --

A. Could have been on TV.

Q. Did you have any conversations with anyone at Reynolds Tobacco with regard to the FDA's classification of nicotine as a drug?

A. I'm sure I did.

Q. Do you recall who you had those conversations with?

A. No. I've had conversations about the FDA with practically everybody there.

Q. Were you surprised when the FDA classified nicotine as a drug?

MS. FORBES: Objection to the form.

MS. KNISELY: You can answer the question.

THE WITNESS: I don't think I was totally surprised.

BY MS. KNISELY:

Q. Why not?

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A. Well, there's been discussion of them doing that for quite a long time.
Q. Do you have any understanding of the FDA's definition of what a drug is?
A. Only a lay -- lay definition.
Q. And what is that understanding?
A. As best I understand it, I think it -- drugs are classified as those things which have effect on the structure and operation of the body or -- I don't remember what the exact terminology is.
VIDEOGRAPHER: Excuse me, Counselor. You have five minutes left on the videotape.
BY MS. KNISELY:
Q. Do you believe that the FDA improperly classified nicotine as a drug?
MS. FORBES: Objection.
THE WITNESS: I really couldn't judge that. I'm not an expert in the area, as I said.
BY MS. KNISELY:
Q. Doctor, when we left off with your employment history, I believe we left you as group leader of one of the groups in the tobacco section. What was your next position after that?
A. We reorganized -- I say we. Let me say they, management, reorganized research and development and combined them into one in the 1980 to '81 time frame. The actual reorganization probably took place in 1980.
We had a new vice president of R & D, and it was deemed a good thing to have an R & D organization rather than "R" organization and a "D" organization. When that reorganization took place, I became manager of a group called -- or division then, called -- terminology changed, as it does in other areas, but -- division manager of integrated technology division of the -- I think it was the applied research group. Now the group is defined as being a larger entity rather than a smaller one, so that divisions were parts of groups, and it was under applied research group, I believe.
Q. Was that a promotion?
A. Yes.
Q. And for how long were you manager of the integrated technology division of the applied research group?
A. About two years.
Q. Did -- as manager, did you have any supervisory role over any persons?
A. Yes.
Q. How many?
A. I really don't remember exactly. On the order of 10 to 20.
Q. And what were your duties as manager of the integrated technology division?
A. I was responsible for managing the division, and, actually, I've already described to you a lot of the work that we did in that division. And I believe I said that -- at that time, that the work that was done in the previous group and the -- that work carried over into the integrated technology division, I think I said, into my next job.

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Q. Okay. Could you just run down a list of those things that continued over so that the record is clear.
A. Well, the nicotine, menthol, moisture, optimizations were completed under that division name, or at least my role in those was continued to that division. The shelf life studies that I described were done under that division. We also did competitive product analysis in that group, in that division. I want to -- can't keep up with all these --
Q. Changes --
A. -- division changes. It was typically division.
VIDEOGRAPHER: Excuse me, Counselor. Excuse me, Counselor. We need to change the tape.
This concludes Tape Number 1 of the Dr. Robert Lloyd, Jr., deposition. The time is 11:27.
(BRIEF RECESS)
VIDEOGRAPHER: This is Tape Number 2 of the Dr. Robert Lloyd, Jr., deposition. The time is 11:30.
BY MS. KNISELY:
Q. Doctor, you were listing for me the work or the subjects of the work that were done while you were manager of the integrated technologies division. Were there any others that you had not listed before we changed the tape?
A. I'm -- I'm thinking back. And -- there may have been, but I don't recall them at this point.
Q. You indicated that part of that work involved competitive product analysis. What types of things did you analyze competitive products -- what types of analysis of competitive products did you do?
A. We did reasonably standard tobacco and smoke analysis. Obviously, FTC parameters, tar and nicotine, CO. We analyzed physical properties, rod draft dilution, filter efficiency, this sort of stuff, standard techniques, and others.
I don't remember exactly specifically what the other compounds we analyzed for, but it was a set. And we would analyze the competition. We might do 20 brands a year, or something like that, just to see if their products had changed.
Q. Did Reynolds Tobacco ever study the nicotine delivery of competitive products?
MS. FORBES: Objection to the form.
MS. KNISELY: You can answer the question.
THE WITNESS: As I said before, yes, we look at nicotine delivery by the FTC method, lots and lots of times in terms of development of products, in terms of competition.
BY MS. KNISELY:
Q. Other than with the FTC method, did you look at nicotine delivery of competitive products by any method other than the FTC?
A. Not at that time, to my knowledge, no.
Q. At any other time?
A. We have looked at other regimens more recently than that, in fact, fairly recently.

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Q. And what are those other regimens?
A. Well, we're currently looking at the Massachusetts regimen. And we've been involved in looking at what the FTC-suggested regimen might be. I think that has just hit the streets recently. I should say published in the Federal Register. That's a little more accurate than "hit the streets," perhaps.

MS. KNISELY: Off the record.

(DISCUSSION OFF THE RECORD)

BY MS. KNISELY:

Q. Other than the Massachusetts regimen, the FTC regimen, which you just mentioned, and the FTC method, has Reynolds ever looked at any other methods or regimens for studying nicotine delivery of competitors' products?
A. We certainly may have in a -- in a research mode. FTC is the -- the recognized measurement and the one that we certainly would use the most.
Q. Have you ever heard the phrase "nicotine transfer"?
A. I'm sure I have.
Q. Do you have an understanding of what the term "nicotine transfer" means?
A. A lay understanding, if you're talk -- depending on what you're talking about. You need to be a little more specific on nicotine transfer.
Q. What is your understanding of nicotine transfer?
A. There are a couple of different kinds of nicotine transfer. You could talk about nicotine transfer from the tobacco to the smoke.
Q. Any other types of nicotine transfer?
A. Well, you -- you tell me. You're asking the questions.
Q. That's right, I am. And your understanding of nicotine transfer is nicotine transfer from tobacco to smoke?
A. I'm trying to decide exactly what you're trying to ask me.
Q. I'm asking what your understanding of the phrase nicotine -- nicotine transfer is, what your understanding is.

MS. FORBES: And I think he's answered that question.

BY MS. KNISELY:

Q. Well, I believe you testified that there are several different meanings to nicotine transfer.
A. I'm saying you might mean something different than that. That's the way I would use the term most in my business, in my part of the business, where I'm testifying to my expertise.

We also might talk about nicotine transfer from the smoke to the smoker. And in that area, I'm not expert.

So, there could be those two different types of nicotine transfer. That's why I was asking you to be more specific.
Q. I'm just trying to get a common definition based upon your understanding of certain terms so that when we talk about certain things as we go through the deposition, you -- we will have the

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same understanding and not be talking at crosspurposes. That's my meaning for asking you the various -- your understanding of the various terms. It's a lot easier for me to change my definition than you to change yours.

What was your next position after manager of the integrated technologies division?

A. Let's see. I moved to a group called -- I think it was called intermediate new brands.

Q. Intermediate new brands?

A. Yes, intermediate new brands.

Q. Was that -- I'm sorry. I didn't mean to cut you off.

A. It was really aimed at the development of brands. I think that, as stated, the time from beginning of development to market might be on the order of up to three years.

Q. Was that part -- part of the research and development department?

A. Yeah, it was part of research and development. It was part of brand R & D, which was a different brand group than applied.

Q. Was it -- it was a group and under that there were various divisions?

A. Yeah. Intermediate new brands was a division of brand R & D.

Q. And brand R & D was a group?

A. Brand R & D was a group.

Q. Under the research and development department?

A. Right.

Q. Now that we've got our structure straight. And what was your position in intermediate new brands?

A. I was manager of the new brands -- intermediate new brands division of brand R & D.

Q. Was that a promotion from your previous position as manager of the integrated technologies division?

A. It was a lateral move. It allowed me to work more with the marketing function. It was a -- a group that explored intermediate, quote, new product ideas. And there was an R & D function. There was a marketing function. There was a marketing research function. The three worked together in a team, or in teams, to look at new brand ideas.

Q. I'm sorry, I missed the first function. You said some function, marketing function, and marketing research function. I missed the first one.

MS. KNISELY: Can you read it back.

THE REPORTER: Yes.

(PORTION OF PREVIOUS ANSWER READ BY REPORTER)

MS. KNISELY: That's it. Thank you.

BY MS. KNISELY:

Q. What were intermediate new brands? It sounds a little --

MS. FORBES: Well, objection.

MS. KNISELY: I'll -- I'll rephrase the question.

BY MS. KNISELY:

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Q. What was meant by intermediate new brands?
A. That's one reason I sort of put intermediate in quotes when I said it.
Q. Yeah.
A. It was based on how long we thought it would take to bring a brand to market from conception of the idea. And we had divided brand R & D into basically three groups. I don't remember what we called brand R & D -- existing brand R & D, which is products which were already in the marketplace, commercial products. Long-term new brand group as a part of brand, which looked at those things which were three years and out in time frame. And intermediate new brand which was intermediate.
Q. Now, I got it.
A. Actually, intermediate didn't exist for that long. It became a part of -- long-term new brands and intermediate new brands were combined, is what I'm trying to say, under me. And I don't remember what the time frame of that was. Somewhere in that '82 to whatever.
Q. You said sometime in around 1982?
A. Sometime probably in 1982. And again, I'm -- I don't know whether it was '82 or '83.
Q. Sure. And what was your position when or -- strike that.
What was the title of the division when the two were combined?
A. If I remember correctly, it was new brand R & D, rather than long-term and intermediate. I believe that's correct.
Q. And you became manager of that division?
A. Right.
Q. And was that a promotion?
A. I don't think so.
Q. How -- what were your duties as manager of the intermediate new brands division?
A. Well, as I said, it was to explore new product ideas with marketing and marketing research. And that really didn't change much when it became new brands. Basically the same duties.
Q. Who was your supervisor when you were manager of the intermediate new brands division?
A. I'm trying to remember. There were -- there were changes in the director of brand R & D in that time frame. John McKenzie, I think, was there in the beginning, but not for very long. And he was replaced, I believe, by Jim Phillips. I think that's correct.
Q. And who was your supervisor during the time you were manager of the new brands division when the intermediate and the long-term were consolidated?
A. I don't remember. Bobby Hardin came in and replaced Jim Phillips at some point in time. There were some pretty rapid changes in management going on then. I would say refinement of the organization after the 1980 reorganization and reshuffle.
Q. Who was your supervisor when you were manager of the integrated technologies division?
A. I believe it was Don Piehl, director of applied R & D.

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Q. For how long were you manager of the new brands R & D division?
A. I believe until 1984.
Q. And what position did you hold after manager of new brands R & D?
A. I think I was director of -- what the hell did we call that group -- new product technology, I believe.
Q. And how long were you director of new product technology?
A. I'm trying to remember if we changed the name of that division. We may have left that alone, which would have made it up until about 1990.
Q. Was that a promotion over your last position as manager of new brands R & D?
A. Going to director of new product technology?
Q. Yes.
A. Yes.
Q. How many people did you supervise as manager of intermediate new brands?
A. It was a smaller number. I think it was about six, and then we combined it with long-term new brand. It was larger than that. And I really don't remember how large it got to be. I know what happened to it in the end, when it became new product technologies, because it was basically renaming organizations.
Q. So, the new product technologies -- the new brand -- strike that.
New brands R & D was moved into or became new product technologies?
A. Became, yes.
Q. So the work kind of pretty much continued uninterrupted but the titles just kept changing?
A. Well, the work changed too.
Q. When you became director of new product technology, what were your duties?
A. Basically, to continue to develop the Premier product.
Q. Had you worked on Premier prior to becoming director of new product technology?
A. Yes.
Q. When did you first start working on Premier?
A. As I said, the -- the intermediate new brands function and the new brands function explored a lot of ideas. Concepts for products that don't burn tobacco was a part of that. And that's one reason I smile whenever we say intermediate new brands, because when Roy Morse assigned me that position and I found out what one of the projects was -- that was the early stuff leading to Premier when it was nothing but various concepts -- I went back to Roy the same day and said, Roy, one to three years is not going to get it for this idea.
And he said, Well, if we call it long-term new brands and we make it more than five years, probably nobody will buy into it.
So, he left it at intermediate new brands until it became new brands and then became new product technology.
Q. And when was it that you first started on Premier? Do you remember the year, around what time?

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A. Well, I say we started the concept -- exploring various concepts, which led finally to Premier in the '81 time frame.
Q. How was it that Premier was different than conventional cigarettes?
A. It was a totally different concept. It was one of a number of concepts which were explored in that early time frame. It took -- we explored -- I say "we" speaking of the group. Part of what we did was to explore different alternatives that didn't burn tobacco. Premier grew out of one of those alternate concepts.
Q. And how is it as Premier came to the -- strike that.

Premier ultimately became a commercial product, sold on the market?
A. That's right.
Q. For how many years?
A. Oh, for about seven or eight months.
Q. And how was the commercial product Premier different from a conventional cigarette?
A. Oh, in every -- almost every possible conceivable way. It was still tobacco wrapped in paper, but it involved the development of many, many different technologies.

The cigarette Premier didn't burn down. It didn't burn tobacco. It burned a carbon heat source. It contained a capsule, a flavor capsule, which was filled with a special tobacco material deposited on alumina beads. It had special papers. It had special filters. It was a very, very different cigarette.

None of the technologies existed except how to make the tobacco roll when we started into Premier. They all had to be developed. It's one thing to have an idea or a concept in the laboratory for -- or a new idea. It's quite different to take an idea like that and fully develop it into a commercial product, which you can make in mass quantities and also sell to large numbers of consumers.

So, none of those technologies existed when we were in the concept stage.
Q. For what period of time was Premier on the commercial market?

MS. FORBES: Objection. Asked and answered.

Go ahead.

MS. KNISELY: I'm sorry.

THE WITNESS: I think I said I think six to seven months.

BY MS. KNISELY:
Q. No. I said what time.
A. Oh, you're asking what time frame?
Q. Yes.
A. Okay.
Q. The dates.
A. I believe it was launched in October of '87. And it was pulled in -- I don't know -- February or March, somewhere in the February to March, April, time frame. I don't know how long it actually stayed on the shelf. The decision was made to pull it off the market in February or March of '88. I

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believe that's correct.
 Q. And who made the decision to pull it off the market?
 A. Our executive management of the company.
 Q. The flavor capsule that was contained in Premier, what was the capsule material made of, or what did it consist of?
 A. The capsule material itself was a -- a special alumina, was quite tightly specified alumina, and I don't remember exactly what the alloy was. The capsule itself was formed from aluminum, a specific aluminum, and was drawn to certain specifications which we developed and which were really new technology for capsule-forming at that time.

We worked with a great number of outside suppliers to develop the materials in quantities that went into that product.
 Q. And the capsule was contained where in the cigarette?
 A. The capsule -- the heat source and capsule were formed -- well, have to go back a little bit.

The heat source itself was extruded, dried. The design of that was very proprietary. One of the keys to the product was that the heat transfer necessitated the capsule -- let me -- let me go the other way.

The heat source and the capsule had to be in very close proximity. In fact, the heat source was inserted in one end of the capsule in order to get the kind of heat transfer which would allow the product to work.

That assembly was then placed inside the tobacco roll itself and that constituted the front end piece or front half of the Premier product.

There were other things in there, too. There was insulation around the heat source, a very special glass insulator that went around the heat source. And I believe that was done -- let me see.

The plug -- the tobacco roll and the -- the glass -- special glass mat that surrounded the heat source were formed in one process. And then I believe the completed, filled capsule heat source with the alumina and tobacco, spray-dried tobacco applied to that alumina, were made in a separate process.

So, there -- there were several different processes that went into making that product.
 Q. Just if I can break down a little bit your last answer. You mentioned spray-dried tobacco applied to alumina?
 A. Right.
 Q. You mean the aluminum beads contained within the capsule?
 A. Yes. Alumina.
 Q. Alumina.
 A. Yes.
 Q. I apologize.
 A. Not aluminum. The capsule was aluminum. The beads were --
 Q. Beads were alumina?
 A. -- a special alumina. I think it was -- it

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was alpha alumina. There are different forms of alumina, which is in aluminum oxide.
Q. You said that the capsule with the attached heat source and the glass insulator, all that was put in the tobacco roll. By tobacco roll, you mean what?
A. By the -- I'm referring now to parts of the front end piece of the Premier cigarette. I wish I had a diagram with me. It would be a lot easier. But basically, the -- the tobacco roll, the standard tobacco that you'd find in a cigarette.
Q. Uh-huh.
A. It's formed in part -- it's formed on a protos maker. That's standard technology.
But then, that part of the front end of the cigarette, the tobacco roll portion, was combined with a glass fiber mat section. Then the entire completed capsule heat source assembly was inserted into that --
Q. Roll of tobacco.
A. -- roll of tobacco and glass fiber mat. It was -- there was a special paper involved that didn't burn back. And I hope I'm getting all this right. It's been a while back. But -- that was basically the process for making the front end of the product.
Q. Uh-huh.
A. There was a tremendous amount of technology and development that went into doing that, because in going from the concept to the product, we didn't -- there was no machinery. There was no technology for the special machinery that it took to make even the front end of the product. So there were no materials and no machinery to make it, and all that had to be developed.
Q. Now, you described the front end --
A. Right.
Q. -- of the Premier cigarette. The back end consists of what?
A. The back end consisted of a combined filter. The first part of the filter, which butted up against the front end of the product, was a specially designed tobacco filter, in the nonmenthol case.
The final end of the filter tip -- and I said it was two-part combined -- was a polypropylene filter. So, if you went from the front to the back of the product, you started with a carbon heat source, surrounded by a glass fiber mat. When you lit the product, the heat source lit. Heat passed through the capsule, released glycerin and tobacco, spray-dried tobacco flavors and other flavors, from the alumina in the capsule. Those were volatilized. They passed through the tobacco filter, which added more tobacco flavor, and the material condensed into an aerosol at that tobacco filter and in the subsequent polypropylene filter. I'm -- I'm working from front to back for you.
Q. I follow you.
A. Okay. And the aerosol then exited the filter end and went to the smoker finally.
Q. Okay. You said that -- that -- and I just

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want to make sure I understand this accurately -- that the filter -- at the filter, more tobacco flavor was added.
A. No, I didn't say that. I said the tobacco filter, the tobacco paper filter, added flavor as the smoke passed through it. I didn't say additives could filter -- I mean, flavor additives could have been put there. And I don't remember whether we, in the actual execution, we had flavor additives in that part or not.
Q. In the filter?
A. I was talking about the natural tobacco taste picked up by the glycerin aerosol as it went through that portion of the filter.
Q. But to your recollection, there was no flavor additives added to the filter?
A. I can't tell you. We did so many different executions of that, some of which had flavor, some of which did not. The tobacco itself contributed to the overall flavor of the smoke. Whether there was a flavor system there or not in the end, I don't know.

There was a flavor system added when we coated the alumina with the spray-dried tobacco extract and the glycerin, and there was a flavor system there.

So, the flavor contributions came from the spray-dried tobacco on the alumina. We also picked up tobacco flavor from the tobacco roll, which is surrounding the capsule. That was heated and air drew through that part as well, picking up natural tobacco flavor, transferring it to the aerosol.

So, the air went both -- the heated air was drawn both through the capsule and through the --
Q. Tobacco --
A. -- tobacco roll that surrounded that. Both then were drawn through the tobacco filter, through the subsequent polypropylene filter, and emerged as aerosol, or a different type smoke. But no tobacco was burned in the system.
Q. The spray -- spray-dried tobacco that was applied to the alumina, where did that come from?
A. We extracted a tobacco blend -- and I swear I can't tell you what's in it -- but it was a blend, I believe, of flue-cured and burley tobaccos, and it was extracted with water. And then that water solution was passed through a commercial spray dryer to make what we call spray-dried extract or spray-dried tobacco flavor.

So, it was basically a spray-dried water extract of tobacco.
Q. Was there any ammonia in -- used in the extraction process?
A. No, I don't think so.
Q. Was nicotine added to the spray-dried tobacco --
A. No.
Q. -- that was sprayed on the ammonia?
MS. FORBES: Objection to the form.
MS. KNISELY: Oh, I'm sorry. On the alumina.

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THE WITNESS: I'm sorry.
MS. KNISELY: Sprayed on the alumina.
THE WITNESS: Do you want to repeat that one?
MS. KNISELY: Yes.
BY MS. KNISELY:
Q. Was nicotine ever added to the spray-dried tobacco that was applied to the alumina?
A. No. All the nicotine delivered by the product arose from the spray-dried extract from the tobacco roll and/or from the tobacco filter. No nicotine was added to any part of the product.
Q. Can you --
A. Of course, when you did a water extract, you got nicotine. So the nicotine was from tobacco. Nicotine and lots of -- excuse me.
You go ahead and we'll go back to that.
MS. KNISELY: Can you read that -- the beginning of that last answer. I think I missed something.
(PREVIOUS ANSWER READ BY REPORTER)
BY MS. KNISELY:
Q. How did the nicotine delivered by the product arise from the tobacco filter?
A. From the tobacco filter. I don't remember what the percentage was. But you had a hot stream of gas forming an aerosol, basically, in that tobacco filter, tobacco paper filter. Any nicotine in that tobacco paper filter -- or let me say, some of the nicotine that's in that tobacco paper filter, would have been picked up and incorporated as a part of the aerosol.
As I remember it, that is not where the majority of the nicotine in the product came from. That is not from the tobacco paper filter, but it was a part of it.
Q. But it was something that was created as a -- as -- as -- through the smoking of the Premier cigarette?
MS. FORBES: Objection to the form.
BY MS. KNISELY:
Q. I'm trying to understand here the -- the creation of it. You've told me that -- that Reynolds did not add any nicotine to the filter.
A. Reynolds added no nicotine anywhere. Only the nicotine that was naturally part of the tobacco and became -- was either naturally part of the tobacco in the tobacco roll or in the spray-dried tobacco or -- and probably to a lesser extent in that filter, the tobacco filter. Nicotine was present all three places, all from tobacco.
Q. And the -- then I'm not understanding what this tobacco filter was. You need to describe this to me, if you will.
A. Okay. The tobacco paper filter was a product produced to our design specs by Kimberly Clark, and that material was part tobacco and part unbleached craft paper, as I remember it. And please don't ask me what unbleached --
Q. I promise I won't ask you what it is.
A. -- craft paper is.

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MS. FORBES: I think it's something you use in kindergarten to make --

THE WITNESS: May be, may be.

But that was a special product produced for us by Kimberly Clark. There was some nicotine native to that material, because it came from tobacco. I don't remember quite frankly how much, but some.

The predominance of the nicotine delivered by the product came from the spray-dried tobacco that was in the capsule, or from the tobacco roll which surrounded the capsule, and was released by the heat of the fuel source in the capsule.

So those were the two main sources, the -- and I can't remember percentages, but that's the predominance. And the tobacco filter contained some nicotine in it and probably released some into the aerosol as well.

BY MS. KNISELY:

Q. What was the purpose of using a tobacco paper filter as opposed to a more conventional filter?

MS. FORBES: Objection to the form.

BY MS. KNISELY:

Q. Let me start and back up.

Doctor, what is the -- the -- the filter that's currently used on Reynolds' products?

A. Most of the materials -- as -- to my knowledge, the only material we use is a type of cellulose acetate filter. I think that's -- that's to my knowledge. I don't know of others.

Q. How long has Reynolds used cellulose acetate filters on its products?

A. Long before I ever came here. Possibly dating back to Winston.

Q. What was the reason why a tobacco paper filter was used as opposed to a cellulose acetate filter on the Premier product?

MS. FORBES: Well, objection to form.

You can go ahead.

THE WITNESS: I think I can answer it.

MS. FORBES: Okay.

THE WITNESS: We didn't use cellulose acetate, because we had put so much technology work into being able to generate an aerosol with -- from all these specific materials. We worked so hard to generate that aerosol, and -- in the front end. Conventional cellulose acetate filtered out a lot of the glycerin and, therefore, a lot of the aerosol.

To put that in layman's terms, what that means is: If you use a cellulose acetate filter on the end of Premier, you didn't get very much smoke, period. Smoke being defined here as the Premier aerosol. So you really would have had a smokeless cigarette at that point, because you wouldn't have got anything, and the consumer wouldn't have bought it.

Is that sufficient explanation for you on that point?

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MS. KNISELY: I -- it helps, yes. It does help.
BY MS. KNISELY:
Q. Why was it that Reynolds chose to have -- to have tobacco as a component of their paper filter for Premier?
MS. FORBES: Objection. Mischaracterizes.
BY MS. KNISELY:
Q. You -- Doctor, you said that the filter for Premier was partly a tobacco filter, or a tobacco paper filter, correct?
A. I said that -- what I meant to say exactly was that the tobacco paper filter section, which was a part of the filter.
Q. Then let me be more --
A. If I said that right.
Q. Then let me be more specific.
A. Okay.
Q. Because I want to be accurate here. And if I do say things that aren't accurate, please feel free to correct me. I'd appreciate it if you would.
Why did Reynolds choose to have tobacco as part of a section of their filter on the Premier?
A. Basically because we wanted to get as much flavor out of that product as we possibly could. And the best way to do that was incorporate as much tobacco as we possibly could.
Q. And which tobacco was used in the -- in the filter?
A. I don't know. I'm not -- I don't remember exactly. It may have been -- it may have been a tobacco stem material in the paper filter -- tobacco paper. I'm trying to get these terms right. Tobacco paper filter.
Q. Had the -- had the tobacco that was used in the filter been treated in any way with any chemicals?
A. I don't think so. Again, that was a Kimberly Clark material that we had spec'd, and all the process that they used was not known to us. It was known to our toxicologists. It wasn't known to me. It was a proprietary paper, I believe.
Q. So, you don't know if the RJR specifications that were given to Kimber -- Kimberly Clark specified whether the tobacco was treated in any way?
A. I really don't know. The best of my remembrance, it was a tobacco stem material which was combined with a craft paper stock, as I said. I think the words were "unbleached craft paper."
MS. FORBES: Ms. Knisely, I need to be in place for a phone call in a few minutes. So when you're at a good place in the next couple of questions, we'll be ready to take our lunch break.
MS. KNISELY: If you could give me just a couple more minutes.
MS. FORBES: That's why I wanted to put you on notice.
MS. KNISELY: Thank you. I appreciate that. I do appreciate that. How many

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minutes are we talking?
MS. FORBES: Four.
MS. KNISELY: Oh.
Doctor, I'm sure it will take us a little bit longer than that to -- to -- to wrap up on -- on this particular issue, so now is as good a time as any, I suppose, to take a lunch break.
Did we want to be back here about a quarter after one?
MS. FORBES: Let's make it 1:20.
VIDEOGRAPHER: Off record at 12:18.
(LUNCH RECESS)
VIDEOGRAPHER: We're back on the record at 1:20.
BY MS. KNISELY:
Q. Doctor, have you ever heard of a company called RJR Nabisco, Inc.?
A. Sure.
Q. Who are they?
A. I think they're the holding company that owns Nabisco and R.J. Reynolds Tobacco.
MS. KNISELY: Could you read that back to me.
(PREVIOUS ANSWER READ BY REPORTER)
THE WITNESS: Whatever a holding company is.
BY MS. KNISELY:
Q. Maybe I didn't make my -- my question clear. Let me see if I can do it this way.
I'm asking if you ever heard of the company RJR Nabisco, Inc., as opposed to RJR Nabisco holding company.
A. Okay. Don't know that I have. What entity is that of RJR, Inc. -- well, never mind.
Q. RJR Nabisco, Inc., as I understand it, is the parent company of RJR Tobacco, and RJR Tobacco Company is a wholly owned subsidiary of RJR Nabisco, Inc.
Do you have an employment --
MS. FORBES: Is there a question?
MS. KNISELY: I was answering the doctor's question.
BY MS. KNISELY:
Q. Do you have an employment contract with RJR Tobacco Company?
A. No, I don't have an employment contract.
Q. Do you have an employment contract with any company?
A. No.
Q. What is your current salary?
A. A hundred and fifty thousand, roughly, compensation total.
Q. When you say "compensation total," what does that include?
A. Salary plus a target bonus.
Q. And what do you mean by "target bonus"?
A. There's a plan called AIAP, which I believe is Annual Incentive Award Program. And it's basically salary or compensation at risk. If the company does well, then we do well. If the company doesn't do well, we do not as well. It's extended to management at certain levels.
Q. Is it extended to all management?

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A. I don't know.
MS. FORBES: Objection to the form.
THE WITNESS: Probably so.
BY MS. KNISELY:
Q. Is it in any way tied to your job performance?
A. Not anymore.
Q. When was it tied to your job performance?
A. It's been tied to job performance to some degree or other up until very recent years, where you had individual goals that you needed to meet or -- R & D goals, for instance.
But now, depending on where you are in the company, as I understand it, it's targeted -- it's tied to financial performance of the company, to, in some cases, market share by various brands, and it's now rather complicated. But it's not individual performance in any case.
Q. What year did Reynolds -- strike that.
What year was the Annual Incentive Award Program that you have described stopped being individual incentive goal oriented?
A. I really am not certain.
Q. As best as you can approximate.
A. It's sometime within the last five years.
Q. How long have you participated in an Annual Incentive Award Program?
A. Ten-plus years. I don't remember exactly when.
Q. And what form of -- of compensation does this target bonus as part of this plan take?
A. It's a -- a goal -- it can be -- depending on your level in management, it can be anywhere from a 14 -- I think 14 percent is probably the lowest target, 13 and a half or 14, and it goes up -- I don't know. Personnel would know how high. But certainly above 30 percent of salary, base salary, at the highest -- higher executive levels. I think this is correct. I'm not sure.
Q. The bonus then takes the form of -- of dollars?
A. Right.
Q. Does each -- strike that.
Do all managers who are participate -- participants in the AIAP program receive the same percentage bonus every year?
MS. FORBES: Objection.
THE WITNESS: I can't really answer that. I don't know.
BY MS. KNISELY:
Q. Do you know how it is determined what percentage bonus -- what percentage of salary the bonus takes for each individual?
A. No.
Q. Do you know who determines that?
A. I would assume it's the compensation group as a part of ER. And it may be as high as board level. I'm not sure about that.
Q. For the ten years that you've participated in the AIAP, have you for each of those years received a bonus?
A. I don't think there's been a year when there was nothing.

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Q. What was the highest bonus that you received as part of this AIAP?
A. I can't remember.
Q. What was the lowest?
A. It was whatever year TI, the TI portion of it got nothing.
Q. I'm not sure I follow. What is the TI portion?
A. Tobacco International. As I said, it's tied to different goals and different departments. And part of our AIAP in R & D has been international because we do work for international. That percentage, to my knowledge, has changed over the years.
Q. How much of the -- was your bonus last year through the AIAP program?
A. I really don't know. I don't remember.
Q. Do you keep tax forms?
A. Sure.
Q. Tax returns. How far back do you have copies of your tax returns?
A. For a long time.
Q. How long is a long time?
A. It's a long time.
Q. More than ten years?
A. (Witness nods head)
Q. And those are at your home?
A. Yes.
Q. Do you --
A. What's the bearing of that?
MS. FORBES: Don't worry about it. It's your private matter.
THE WITNESS: Okay.
MS. FORBES: Go ahead.
BY MS. KNISELY:
Q. Other than the Annual Incentive Award Program and your salary, has there been any other compensation that you were paid for the positions that you've held at Reynolds Tobacco?
A. There's a -- a long-term incentive plan.
Q. And what is that?
A. That I'm not as clear on. It's paid out over different time periods. There have been a couple of different long-term incentive plans that I participated in over time. And I just can't tell you. I don't remember what those values were or when they were paid.
Q. They were paid in dollars?
A. As I remember it, they were paid in dollars.
Q. Were they tied to individual job performance?
A. I don't think they were. I think they're tied more to company.
Q. As part of your compensation for your positions at Reynolds, have you ever received stock options?
A. Yes.
Q. And those stock options are in what company?
A. They're paid in common stock, RN common stock.
Q. I'm sorry. You said what type of common stock?
A. RJR common stock.
Q. Which RJR company?

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A. Which is RN.
Q. What is REN?
A. RN is the ticker symbol.
Q. Oh, RN.
A. Yeah.
Q. And what does RN stand for?
A. To me it's R.J. Reynolds.
Q. Which R.J. Reynolds? R.J. Reynolds Nabisco or R.J. Reynolds tobacco?
MS. FORBES: Objection.
BY MS. KNISELY:
Q. Or any other R.J. Reynolds.
A. All I know is the ticker symbol is RN. It is not NA. NA is Nabisco. zzz
Q. For how long have you held these stock options?
A. Different time periods.
Q. And what were those time periods?
A. I don't know. I've had some stock options back into the -- oh, certainly into the '80s, before the buyout.
Q. Have you received stock -- strike that.
When you refer to the buyout, what are you referring to?
A. The purchase of RJR Nabisco by KKR.
Q. And who is KKR?
A. Kolberg, Kravitz & Roberts, when the company was taken private in -- when was that -- early -- early '88, '89. Probably '88.
Q. Have you ever performed any services for RJR Nabisco, Inc.?
A. A person who reports to me now has performed some services for -- excuse me. You asked RJR, Inc.
Q. RJR Nabisco, Inc.
A. Okay. RJR Nabisco, Inc. This person has performed services for Nabisco.
Q. And what were those services that the person performed for Nabisco?
A. He's an analytical chemist, and he advised them on the -- as an analytical chemist, on the development of -- whatever the name of the fat substitute --
Q. Simplex?
A. Simplex.
Q. And who is that person under you who performs these services for Nabisco?
A. Performed.
Q. Performed. I'm sorry.
A. Past tense. Burt Gordon.
Q. And for how long did he perform these services for Nabisco?
A. I'm not sure. I took over the group I'm in now in October of '92, I believe. And he was already engaged in that effort when I came on board. And he stayed with that for a year or year and a half, after I came on board. It was set up -- it was allocated cost to Nabisco. That is, we billed them every year for services rendered as a part of the budgeting process.
Q. Do you know if those bills were ever paid?
A. Yes, they were paid.
Q. Who were they paid by?

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A. I don't have a clue.
Q. To your knowledge, was there ever any other work done by someone holding a Reynolds Tobacco position for work done for Nabisco?
A. Johnny Hayes worked on that same project.
Q. John Hayes?
A. Johnny Hayes.
Q. Do you by any chance mean Wally Hayes?
A. No.
MS. FORBES: No.
THE WITNESS: I mean Johnny Hayes, also a toxicologist.
BY MS. KNISELY:
Q. And when did John Hayes work -- do work for Nabisco?
A. At least during that same time period. And I'm not sure as to how long that continued.
Q. Was that also billed out to Nabisco?
A. Yes.
Q. Was that --
A. To my knowledge, it was.
Q. Was that paid?
A. I'm assuming it was. I wouldn't know that for certain, because that was not in my unit.
Q. Whose unit was it in?
A. You know, I don't know who Johnny reports to anymore. It might have been -- at one -- at the time I'm talking about, it was probably in Wally Hayes' unit.
Q. With regard to the stock options that we've talked about, were they tied to individual job performance?
A. I really don't know. It was -- as I understand it, it's at the discretion of the person who heads the department whether you get stock options or not. Everyone -- every manager does not get stock options, nor are the amounts of those stock options the same.
Q. What are the -- what is the dollar value of the current stock options that you possess?
A. As of yesterday, they were about 34 bucks a share.
Q. And how many stock options do you currently have?
A. I'm not sure what the exact figure is.
Q. As best as you can approximate.
A. I'm trying to separate in my mind what is common stock that I own and what is options. Probably somewhere on the order of 13, 15,000 shares, options, at different price points. And if you want me to break that down for you, I can't. I don't know.
Q. Have you ever completed any IRS tax election forms with regard to any stock options you've received as a result of your work at Reynolds Tobacco?
A. Be more specific on that. I don't think I understand what you're asking me.
Q. I have seen tax election forms, IRS election forms, that were filed by some people who hold positions at Reynolds Tobacco with regard to the stock options that they obtained as a result of their work at Reynolds Tobacco.

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Have you ever filled out any IRS election form, tax election forms, with regard to those stock options that you obtained through your work at Reynolds Tobacco?
A. I'm not sure. I'm not sure I know what an IRS election form is.
Q. We'll see if we can find you one.
A. Okay.
Q. Have you ever participated in RJR Nabisco's Management Equity Program?
A. Describe for me what a management -- what the Management Equity Program is. I'm not sure that I'm totally familiar with the term.
MS. KNISELY: I'd like to mark as, I guess, Plaintiff's 2 a 17-page document entitled Management Equity Participation Plan, RJR Nabisco. And up at the top on each page it carries the logo, RJR Nabisco Management Equity Participation.
(EXHIBIT NUMBER 2 WAS MARKED FOR IDENTIFICATION)
BY MS. KNISELY:
Q. I will tell you that this document was produced to us by David Isbister in response to a subpoena that we issued in this action. I believe the handwriting that appears on here is that of David Isbister.
But I'm not going to be asking you any questions about the handwriting. It's simply, the document itself, from my understanding, puts forth Nabisco's Management Equity Participation Plan. And I would ask you to take a look at that, if you would.
(DOCUMENT HANDED TO WITNESS FOR REVIEW)
A. I'm going to have to switch glasses now.
(WITNESS REVIEWS DOCUMENT)
I have not seen this document before, to my knowledge, but from the description of the plans that are in here, I participate in it, or participated in it.
Q. Okay.
A. In both -- both plans.
Q. And which are those both plans?
A. The Stock Purchase Plan, the Stock --
Q. Which --
A. -- Management Equity Plan -- I think that's the name of the overall thing. But a portion of that was the Long-term Incentive Plan. I think I mentioned it a few minutes ago. I'm not sure whether I did or not, but I think I did.
The LTIP, which was, I think, an extension of the prior Long-term Incentive Plan that RJR had. So, yeah, I participated in both of these plans.
Q. If I could refer you to page 17 of that particular document, just so we're clear on talking about the same terminology.
A. Okay.
Q. The plans that you've participated in, page 17 says a Summary of Top Management Compensation Programs.
A. Okay.
Q. It's got Salary, Award Incentive -- or Annual Incentive Award Plan, New Management, Equity Participation, and a five-year cash Performance

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Plan for selected executives.
A. Right.
Q. Which of those plans would you have participated in?
A. All of them, I think.
Q. And you participated in them with regard to your work for Reynolds Tobacco Company?
A. Yes.
Q. Can I refer you to page 2 of the document, the second paragraph: (Reading)

> The grant of these purchase shares and options to approximately 300 key executives and of units under the Performance Plan to about 200 of this group is determined by the Chief Executive Officer and Board of Directors, who administer the Plan. Each participant's grant will reflect the individual's role within RJR Nabisco and potential impact on our long-term success; grants will not be based on job level or salary.

Does that refresh your recollection as to whether the stock options that you received were individual -- related to individual job performance as opposed to company performance?
A. I'm still not sure that any of these are based on individual performance other than the decision of whether or not to grant the person options, which is, I said, as I understood it, was the -- at the discretion of -- in the case of R & D -- the senior VP of R & D or executive VP of R & D.
Q. Do you have a reason to doubt the accuracy of this statement on page 2?
MS. FORBES: Objection to the form.
THE WITNESS: Well, I've told you what I knew about it already. And as I've seen, this document is -- is news to me. In fact, it's sort of interesting here that it says that there's a guaranteed 10 percent -- so that I use the right terms, let me look at it.
MS. KNISELY: Sure.
THE WITNESS: Guaranteed 10 percent appreciation. That's news to me. I didn't know that. It's better than the stock's done.
BY MS. KNISELY:
Q. I would also like to show --
MS. FORBES: Off the record.
(DISCUSSION OFF THE RECORD)
BY MS. KNISELY:
Q. I would like to show you a document that we'll mark as Plaintiff's 3. It's a three-page document. I will also tell you that these pages were produced by David K. Isbister in response to a subpoena in this -- that was served upon him in this action.
If you would take an opportunity to look at those three pages, if you would.

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(WITNESS REVIEWS DOCUMENT)
MS. FORBES: Why don't you mark that. I've written on that one. I just wanted to give him a copy so he could start looking at it.
Just have you look at the official version of it.
(EXHIBIT NUMBER 3 WAS MARKED FOR IDENTIFICATION)
(WITNESS REVIEWS DOCUMENT)
THE WITNESS: Okay.
BY MS. KNISELY:
Q. Have you had an opportunity to review those documents we've marked as Plaintiff's 3?
A. I have looked through this, yes.
Q. The first page is dated November 29, 1989, and entitled Management Equity Participation. There is a list of names as well as titles: Equity Purchase and Impact Level.
A. Right.
Q. Does your name appear anywhere on that document?
A. Obviously does.
Q. Robert A. Lloyd, Jr. That's yourself?
A. That's myself.
Q. And at that time on November 29, 1989, you were holding what position with Reynolds Tobacco?
A. Staff VP, new product technologies.
Q. And at that time, you were provided through the management equity -- sorry. At that time, you were provided through RJR Nabisco's Management Equity Participation Plan what equity purchase?
A. Twenty thousand bucks' worth. Four thousand shares at five bucks a share.
Q. As you look down the list of names on that page, do you recognize all of those names?
A. Well, I'll have to take another look and see if I recognize all of them. I recognize certainly most of them.
Q. Uh-huh.
(WITNESS REVIEWS DOCUMENT)
For the time being, I'm just asking you about the first page.
A. Okay. Yeah, I recognize them.
Q. To the best of your knowledge, did all of those people on the first page who are listed hold positions with Reynolds Tobacco Company as of November 29, 1989?
A. To the best of my knowledge, yes.
Q. To the best of your knowledge, did they hold the positions at Reynolds Tobacco as listed under "Title" across from their respective names?
A. I don't really know that. I know mine and a couple of others, and that's about it.
Q. The second and third page -- it appears that the second and third page is a -- is a two-page document, both pages dated December 18, 1989, again, Management Equity Participation, with a list of names: The Title, Original Purchase Price, Additional Purchase Price, and Revised Total Purchase, with various dollar amounts.
Does your name appear anywhere on either of those two pages?
A. Yes.
Q. That's the Robert A. Lloyd, Jr., listed?

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A. Yes.
Q. As of December 18, 1989, what was your position with Reynolds Tobacco?
A. As I remember it, it's as listed: Staff vice president, new product technologies.
Q. And as of that time, the original purchase price for the options which you were provided at that time was what?
A. I'm pretty sure that I bought 4,000 shares at $5.00 a share. The options were for four times that amount more at the price of $5.00 a share.
Q. Did RJR Nabisco loan you any money to purchase those shares?
A. No, they did not.
Q. Was that an option that was available to you at the time?
A. I believe it was.
Q. Do you know if that was an option that was available to others on the list?
A. I wouldn't have any idea. I'm sure this list was never meant for me to see in the beginning.
Q. As you look down the list contained on pages 2 and 3 of Plaintiff's Exhibit 3, are there any people on there who you do not recognize?
A. I don't know that I recognize Taylor Bailey, but director of tobacco processing, I recognize the position.
Q. Any other person on that list you don't recognize?
A. Still looking. I don't personally know Don Caudle. I don't know that I know that name. But if he was part of admin and planning for TAC -- TAC was Archer division of tobacco at one time. I don't know James Lippard, but it's a name that I have heard.
Q. Other than Mr. Bailey, Mr. Caudal, and Mr. Lippard, do the names that -- to the best of your knowledge, do the people who appear on this list, were they -- did they hold positions at Reynolds Tobacco Company as of December 18, 1989?
A. I can't tell you whether they held the positions that date or not. I would assume that they did. They're all names that are familiar to me, and I assume they did from this document.
Q. I believe when we last left you in terms of your employment history -- we keep straying from that. Let's see if we can finish it.
We left you having become the director of new product technology division. And you were in that position, I believe, until 1990?
A. I was involved with new product technology group. I was not in the position of director until 1990.
Q. I'm sorry. My apologies. For how long did you hold the position of director of new product technologies?
A. I think I held it until I was promoted to staff vice president of new technologies, which was, I believe, in 1988.
Q. I'm not sure I follow. Maybe I missed something. You indicated that you became director of new product technology as of 1990 and you held that position until you became vice president of

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new product technology in 1988. Did I misunderstand?
A. I don't think so. Maybe I made a mistake. That's not correct.
Q. When did you become vice president of new product technology?
A. Let me -- let me think back here, if we've got a -- new product technology is the group that I went to after new brands. And that took place about 1984, I believe, is when we changed the name of that part of the unit. Maybe we didn't get through all of that.
Q. We had talked about the intermediate new brands con -- consolidated with the long-term new brands, and you became manager of the new brands division --
A. Right.
Q. -- for R & D. And when you left as manager of the new brands R & D, that actually became new product technology, and you became director of that.
A. A part of new brands, the part -- I think where we were before lunch was on Premier. The Premier part of what we're working on in the new brands group became new product technologies. And the development of Premier and other types of new technology products fell within that new product technology group.
What ended for me was my involvement with marketing and marketing research, exploring other new brand opportunities. Premier itself became so big at that point, I couldn't handle both responsibilities.
Q. So, the marketing aspects of new brands and the marketing research function went where?
A. That's not quite the right interpretation either. Let me try explaining a little more.
Q. Okay.
A. The -- the group that continued to explore new product ideas that was part of new brand was composed of an R & D component, a marketing component --
Q. Component.
A. -- and a marketing research component.
Q. Component.
A. I had responsibility only for the R & D component of that.
Premier -- or the precursor to Premier, the concepts that became Premier, were part of that new brand group. When in 1984, when we split new product technology off, I gave up all the other exploratory ideas except for the Premier type.
Q. The research and development function of new brands including Premier?
A. No.
Q. Just -- you just took Premier?
A. I -- I had a choice -- let's put it -- I had a choice. I could take Premier and continue the development of that, solely, or I could go and explore those other new brand ideas.
Q. I think -- I think we're close here. Let me ask this question and see.
A. Okay.

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Q. I think I got it here.
When you left and you changed from manager of new brands R & D at research and development, and you went to become the director of new product technology, the only work that you carried with you or continued into your new position was that to do with Premier.
A. That's it.
Q. What --
A. Along with most of the people who were doing it.
Q. One would assume so. What happened with all of the other work that was being done by new brands? Did -- did somebody else take over new brands, or did new brands shift somewhere else?
A. I think somebody else took it, but I swear I don't know who it was. Let me say I'm not sure I know who it was. I don't want to use the word "swear" right there.
Q. Now, we're back to: When did you become director of new product technology division? Because I think we're unclear on the record as to when that actually happened.
A. We split the group out, and I believe it was in 1984. I'm not sure when I became director. I don't remember whether I moved as manager and then was appointed director, or whether it was something that happened at the time.
Q. And you held the position of director of new product technology division until you became the vice president of the new product develop -- new product technology division?
A. Right.
Q. When was it that you became vice president of new product technology division?
A. I became staff vice president --
Q. Staff vice president.
A. -- which is different, different than vice president officer. I believe that was in 1988.
Q. That was a promotion?
A. Yes.
Q. Did your duties in any way change when you became -- when you changed from director to staff vice president?
A. During that whole period of time, from 1984 to 1990, my duties probably changed daily. But it was because Premier was scaling up.
Premier started -- I think when we split Premier off from new brands, it had grown to about -- and this is real rough -- but maybe 40 people. By the time we reached 1988 -- well, let me go back to -- at launch time of Premier or shortly thereafter, I had close to a hundred people reporting directly to me and had another hundred and seventy-five so-called matrixed to the Premier project, which meant they didn't report to me directly but I still had -- they're still working sort of for my group, if you --
Q. You had some supervisory role over them?
A. Yeah.
MS. FORBES: Ms. Knisely, just for the record, just as we did with Dr. Green's deposition, Reynolds will invoke paragraph 11 of

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the Case Management Order concerning confidentiality.

I will just put you on notice at this time. The amount of staffing that was involved with Premier is considered proprietary business information. So at least for a short-term designation, I want to put you on notice as far as this discussion goes, is considered proprietary business information.

MS. KNISELY: Confidential.

MS. FORBES: Confidential.

MS. KNISELY: We would place on the record -- and this is just lawyer stuff -- that as we did with Dr. Green's deposition, there are certain provisions of the protective order which require us to notify you of our objections as to any confidentiality designation.

And we would put defense counsel on notice, we object to the wholesale confidentiality designation as it -- as it has been invoked as to the entire deposition and would ask that within the appropriate number of days, as set forth in the order, that defense counsel provide us with -- with redesignations limiting the confidentiality to the essential information.

MS. FORBES: I understand. I just want to be absolutely sure. To -- to the extent that R & D depositions of other companies, other tobacco companies, are being taken, this is not information that would be appropriate to be used in examination as far as a comparative level.

Let's just go off the record for a second.

MS. KNISELY: Yeah.

VIDEOGRAPHER: Off record at 2:13.

(DISCUSSION OFF THE RECORD)

VIDEOGRAPHER: We're back on record at 2:17.

MS. FORBES: For the record, after discussion off the record, Reynolds would invoke the highly confidential designation pursuant to the protective order for Dr. Lloyd's discussion of Premier, its specific technology, staffing, and those issues surrounding Premiere. It's highly proprietary business information. And at least for the initial designation should be treated as highly confidential, subject to redesignation. Thank you.

MS. KNISELY: And as we discussed off the record, plaintiffs would object to the wholesale designation of those subjects as highly confidential and would put defense counsel on notice, pursuant to the requirements of the protective order, that the redesignation needs to be done within the time frame set forth in the protective order or certain features of that protective order will kick in and redesignate on its own, so to speak.

MS. FORBES: That's fine.

BY MS. KNISELY:

Q. Now that we've done our lawyer thing, we'll go back and see where we left you off once again on your history, employment history. We'll get

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through this yet. You --
A. I hope I will.
Q. You became staff vice president of new product technology division in 1988. For how long did you hold that position?
A. I believe until around 1990. Let me make sure this is right. 1990 is probably right.
Q. From 1984 through 1990, did you work exclusively on Premier?
A. Yes.
Q. And during that time, what was your particular work on Premier?
A. I managed the whole development effort.
Q. Is it fair to say that you were the top man in charge of Premier?
A. Well, Bob DiMarco probably will think he is. But he had other responsibilities. I reported to Bob.
Q. And what position did Robert DiMarco have during that time?
A. I believe he was senior VP.
Q. Of --
A. Of R & D.
Q. What position did you move to in 1990?
A. I moved to new business development.
Q. And what position did you hold?
A. I believe initially I held staff vice president, new business development.
Q. Was that in the research and development department?
A. Yes.
Q. At Reynolds Tobacco?
A. Yes.
Q. And what was the new business development division?
A. I think before I answer that one, if we could, could we take a break, because I think we'll be into this one for a while.
MS. KNISELY: Okay.
VIDEOGRAPHER: This -- this concludes Tape Number 2 of the Dr. Robert Lloyd, Jr., deposition. The time is 2:22.
(BRIEF RECESS)
VIDEOGRAPHER: This is Tape Number 3 of the Dr. Robert A. Lloyd, Jr., deposition. The time is 2:39.
BY MS. KNISELY:
Q. Doctor, I believe I had asked you whether Premier was a safer cigarette. And you had indicated you didn't know one way or another whether it was a safer cigarette. Is that correct?
A. Yes. And I said we couldn't prove it was a safe cigarette. So, obviously, we couldn't say that.
Q. Was it a safer cigarette than the other cigarettes on the market at the time?
A. That would depend on how you define it. Up front, I'll say I'm not a toxicologist, and I'm not. But the testing scheme that was done -- and let me go back again to the objectives of the Premier project.
The objectives were to develop a -- and I'm paraphrasing -- consumer acceptable cigarette

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which did not burn tobacco, and which simplified the chemistry of cigarette smoke by not burning tobacco, which reduced the biological activity of smoke by not burning tobacco, and which reduced the environmental tobacco smoke output relative to other cigarettes that were available in the marketplace. All three of those objectives.

Q. Did that make it a safer cigarette?

A. Well, I'm trying to get to that.

MS. FORBES: Objection.

MS. KNISELY: Oh, I'm sorry. I didn't mean to cut you off. I apologize.

THE WITNESS: Okay. The criteria for a simpler smoke was met. The criteria for a reduction in biological activity as the comparative testing protocol for the biology -- as little as I understand that -- was met, and the ETS reduction was certainly met.

So, did that make it a safer cigarette? Some people would probably say yes, based on those criteria, and based on the testing protocol that was developed and carried out at Reynolds and which was -- the protocol was approved by the Scientific Advisory Board, which looked at all the protocols for all the testing we did. And those were outside people, very eminent outside scientists.

So, we took where we were in terms of the total market with the cigarettes that we sold and others sold, and we tested Premier against a reference product, or reference products, which were University of Kentucky reference cigarettes which were made to simulate what was in the market at the time.

And the 1R4F reference cigarette is the one that was used in most of the testing that was done on Premier, both chemically and biologically. And it was chosen because it was representative of the low-tar cigarettes sold at the time, that is, fuller flavor low-tar cigarettes.

So, all the testing is relative testing. And it's all relative to that reference or similar reference cigarettes. And we chose that because it's an unchanging product. That is a representative fuller flavor, low-tar product representative of other fuller flavor low-tars that are commercially sold.

And the reason we did that is picking a commercial product at a point in time could be subject to change. And we wanted a reference that we could test against and which other scientists could obtain and test against and know that they were testing against the same product.

Q. In your opinion, was Premier a safer cigarette?

MS. FORBES: Objection. Asked and answered.

BY MS. KNISELY:

Q. I understand the explanation that you've gone through. But when you boil it all down, yes or no, was it a safer cigarette?

MS. FORBES: Same objection.

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THE WITNESS: I can't --
MS. KNISELY: You can answer --
THE WITNESS: I don't think I can answer that yes or no. If I'm to give you the -- the full truth, I may have to expand a little bit beyond yes or no.
MS. KNISELY: Then you can do that.
MS. FORBES: You're permitted to do that.
THE WITNESS: Do I think it was safer? Let me put it this way: I've looked at what our critics have said about our products, other scientists, other good scientists. I've looked at what they've alleged versus the chemistry of the smoke, where I am sort of expert. I've looked at versus the biology, and I've had the liberty of working with some good toxicologists.
And was it safer? I don't know. But we reduced or eliminated most of the compounds that our critics have said were problematic from a health standpoint. Whether we agreed with them or not, we still reduced them.
We've reduced the overall complexity from the chemistry greatly. Premier, as I understand it, showed basically no biological activity, whereas other cigarettes in the marketplace in these specific biological tests show activity.
So I would say that overall, you'd have to ask the critics and the experts in the area, but we met the design objectives of Premier, at least in those areas of reduced biological activity, reduced chemistry, and reduced ETS.
Is that safer? I can't judge that.
BY MS. KNISELY:
Q. Where we left off before the break, we left you at staff vice president, new business development division. Is that your current position?
A. No.
Q. Oh, okay. I thought we were getting close there. For how long did you hold the position of staff vice president, new business development?
A. Until 1992.
Q. And what were your duties as staff vice president, new business development?
A. We worked on two large projects. We, the group, worked on two fairly large projects which had been concepts which had been tested with consumers, and which had scored as being products which, if they were developed, would be of high interest.
Q. And what were those products?
A. One was a product -- or project called XA, and it dealt with reduced sidestream products, which we tried to develop a range of reduced sidestream products across the full flavor to ultra categories. And we developed technologies to lower sidestream --
Q. When you say --
A. -- further than it had been before.
Q. When you say "sidestream," you mean sidestream smoke?

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A. Sidestream smoke, yes.
Q. And what was the other project?
A. The other project was XB.
Q. And what was Project XB?
A. A scientist in England named -- I believe it was Michael Russell. He's a member of the Hunter Committee in the UK, which basically had oversight responsibility for cigarette products, had suggested that -- in scientific papers -- again, I'm paraphrasing -- that nicotine is basically innocuous and that the portion of cigarette smoke which, in his words, caused harm, was the tar.

He further suggested that if you lowered nicotine and tar to the point where the product would no longer sell very well, that you had basically done nothing for the public health. And he was a public health type person.

So he suggested that what the industry needed to do was to maintain tar at the full flavor low-tar level and maintain acceptability -- what did I say? I think I said it wrong -- to maintain nicotine at the low-tar level and reduce the tar, that way maintaining consumer acceptability and at the same time lowering tar and, in his words, lowering risk or harm or whatever he used.

Basically, he was saying: If the consumer doesn't smoke it and doesn't find it acceptable, it's not going to sell, and therefore it does nobody any good.

Q. An extension of his thoughts, then, would be that the reason people buy cigarettes is nicotine, is it not?

MS. FORBES: Objection to the form.

THE WITNESS: I'm not sure you can make that extension. I tried to explain it as best I could. But if they -- I don't think they only smoke for nicotine.

What his point was, that whatever was sold had to be consumer acceptable. And maybe I'm interpreting for him now, but I'm giving you my understanding of what he said and the reason that we set off to make products with reduced tar and nicotine ratios.

BY MS. KNISELY:

Q. But as you've described it, Michael Russell was tying consumer acceptance to the level of nicotine in the cigarette, was he not?
A. He may have been. I can't speak for what he said. I've tried to paraphrase my understanding of that.
Q. Did his scientific papers that you talked about -- have you -- you've read those scientific papers of -- of Michael Russell's?
A. I've read some, but it's been a long time.
Q. Do you have any of those papers?
A. I don't know that I have any, no.
Q. Do you know where they were published?
A. I don't know. They were leading -- leading scientific journals. I can't tell you which ones. I don't know which ones.
Q. Was it Dr. Russell?
A. I'm pretty sure it was, yeah.
Q. Did Dr. Russell tie consumer acceptability of

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cigarettes to anything other than nicotine --
MS. FORBES: Objection to the form.
BY MS. KNISELY:
Q. In his papers --
MS. FORBES: Same objection.
THE WITNESS: Well, he --
MS. KNISELY: Then let me rephrase it.
BY MS. KNISELY:
Q. Did Dr. -- what did Dr. Russell tie consumer acceptability of cigarettes to?
A. I don't know that I can tell you anymore than I already have. I think what he said was: If you lower tar and nicotine both to low levels such as in some of the ultralow-tar products, which are available here and elsewhere, that dogs wouldn't eat them.
Q. People wouldn't --
A. Basically.
Q. People wouldn't --
A. People wouldn't smoke them.
Q. But people would smoke -- buy -- buy and smoke a cigarette in which nicotine levels were maintained at a fuller flavor level with a lower tar?
MS. FORBES: Objection to the form.
THE WITNESS: That was -- that was his opinion.
BY MS. KNISELY:
Q. Was that opinion accepted by Reynolds?
MS. FORBES: Objection to the form.
MS. KNISELY: I'll rephrase it.
BY MS. KNISELY:
Q. Was Reynolds of a similar opinion?
MS. FORBES: Same objection.
MS. KNISELY: You can answer the question.
MS. FORBES: If you can.
THE WITNESS: If I can, yeah.
As I said, we had done some consumer research that indicated that consumers would be interested in a couple of -- I say we. Let me say that's marketing, research and marketing. That if we could produce a 5-milligram product that smoked like a 10-milligram product in tar, that they would be very interested in that provided it gave them the same satisfaction in smoking acceptability at the lower tar range. They said the same thing for a 1-milligram product that smoked like a 5-milligram product.
Based on that consumer interest, we felt it was justified to try to follow-up with some of what Russell had suggested and to try that.
BY MS. KNISELY:
Q. And did Reynolds try that?
A. Yes, we did.
Q. Do you know of any other tobacco company that also tried that?
A. I don't know. Again, let me go to technical for -- more technical for a minute. Going back to the studies of Neumann, which we talked about earlier today, the nicotine optimization studies, we had known for a long time that reducing

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tar-to-nicotine ratios could be done in terms of actually technically doing it. The problem with reduced tar/nicotine ratios is below a certain ratio, the products become very, very harsh. They become unsmokably harsh, and not consumer acceptable at all.

The other piece of technology which we looked at in product XB was a way to ameliorate that harshness and still reduce tar-to-nicotine ratios. And this was through the addition of acids. Nicotine is a base. Organic bases react with acids to form salts. So we looked at different acids which we might add to products with reduced tar-to-nicotine ratios in order to cut down on the harshness of the product and try to make it consumer acceptable. We looked at numbers of different acids.

Q. And what --

A. Among them was levulinic acid. We found that, yes, the products where levulinic acid was added, or other acids, were smoother and less harsh at reduced tar-to-nicotine ratios. However, many of those acids gave offtaste of the smoke. That is, you could taste the acid material, or the acid salt material which broke down to give you the acid. And it was a taste turnoff, if I can use that shorthand. But, basically, it was not consumer acceptable because there was an offtaste present in the smoke.

With levulinic acid, it was very effective in smoothing out the harshness of the low tar and nicotine ratio product, but levulinic acid turned out to be a material which some consumers could not get a taste impact from, that is, an offtaste in the smoke, but others could.

So, some people could get the effect, some people couldn't get the effect, that effect being the offtaste in the smoke due to their sensitivity, if you will, to levulinic acid.

So, there was a great portion of the population that could. And that made it not a mass market product.

So despite the fact that we could technically do it, it wasn't acceptable to a large body of consumers. So, basically, the product -- no product based on that technology was ever launched. Never commercialized.

Q. You said there were two -- two ways that Reynolds knew for a long time how to decrease the tar-to-nicotine ratio.

A. I'm sorry. I didn't hear the first part of that question.

Q. You said that there were -- when you first started your answer, you said that there were two ways that Reynolds knew for a long time how to decrease the tar-to-nicotine ratios, could technically be done. You talked about one of them being the addition of -- of acid to form a salt, and levulinic acid in that regard.

What was the second -- the second --

A. Can we read that back?

MS. FORBES: Objection.

MS. KNISELY: Sure.

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MS. FORBES: It mischaracterizes --
MS. KNISELY: Could you read back where the witness started his answer to the last question.
(PREVIOUS ANSWER READ BY REPORTER AS FOLLOWS:
I don't know. Again, let me go to technical for -- more technical for a minute. Going back to the studies of Neumann, which we talked about earlier today, the nicotine optimization studies, we had known for a long time that reducing tar-to-nicotine ratios could be done in terms of actually technically doing it. The problem with reduced tar/nicotine ratios is below a certain ratio, the products become very, very harsh. They become unsmokably harsh, and not consumer acceptable at all.
The other piece of technology which we looked at in product XB was a way to ameliorate that harshness and still reduce tar-to-nicotine ratios.)
MS. KNISELY: That's -- that's as far as we need to go.
THE WITNESS: Okay.
BY MS. KNISELY:
Q. When you said the other technology and referred to the other technology, what was the first technology?
A. Just the ability to reduce tar-to-nicotine ratios.
Q. And how was that done?
A. Through blending mostly. And again, I said earlier, I believe that that's not always wholly successful. Well, one of the ways it is not successful is, you can either get offtaste -- and I was talking about research cigarettes, when I talked about the Neumann study. The real -- and acids have been tried, added to products before, but we thought with levulinic acid, we really had something, until we found that many consumers could detect it and didn't like it.
Q. Over the years, though, since that time, Reynolds has gotten much better at blending their tobaccos, have they not?
MS. FORBES: Objection to the form.
BY MS. KNISELY:
Q. You indicated earlier today the only way that Reynolds controls nicotine -- the level of nicotine in its products is through blending; is that correct?
MS. FORBES: Objection. Mischaracterizes.
BY MS. KNISELY:
Q. Is that correct?

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A. I'm not sure.
Q. Each of Reynolds' brands of cigarettes has a particular nicotine level, does it not?
A. I don't think they're all that different. If you look within a tar category -- for instance, if you look at full flavor cigarettes, the tar and nicotine are more or less the same in all of our brands.
Q. But you --
A. If you look at lights, they're more or less the same, but they're different than full flavor. I mean, ultra the same.
Q. That's not --
A. But that's because consumers want a variety of products.
Q. That's not my issue.
MS. FORBES: Okay. Please --
MS. KNISELY: That's not my question.
MS. FORBES: All right. Wait a second. Objection. Please let Dr. Lloyd respond to your question. If you have a follow-up question, then ask it. But the record will be a lot cleaner and we'll get through this a lot faster, if we wait for questions and then let answers --
MS. KNISELY: Doctor, that's --
MS. FORBES: -- be completed.
MS. KNISELY: -- that's --
MS. FORBES: And the same with objections.
MS. KNISELY: That's not my question.
MS. FORBES: Give me that courtesy.
BY MS. KNISELY:
Q. That's not my question, Doctor. My question is: Each particular brand has a level of nicotine in it, whether it's the same as another brand, whether it's the same as another full flavor or not. Each brand has -- or each cigarette has a nicotine level in it, correct?
A. I think that's probably correct, to the best of my knowledge. It has what it has.
Q. And a brand, when you put a nicotine level on the outside of the brand, or on the advertising, there is a number next to the nicotine level, correct?
A. You say nicotine level. That means nicotine delivered by the smoke by the FTC method.
Q. That's fine. We can go with that.
A. When you say contains, contains is different.
Q. I'm sorry.
A. When you say contains, you're talking about the percentage of nicotine that's in the tobacco in the cigarette, which is not the same thing, and is influenced by lots of -- in nicotine delivery, delivered is influenced by many factors, including air dilution, filter ventilation, which is the same thing, paper porosity, lots of things. And again, I'm not an expert in that area, but I know that to be the case.
Q. You said air dilution, filter --
A. Air dilution can be either filter ventilation

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or it can be due to paper porosity, but in general, it's air dilution of the filter, can be -- the amount of nicotine delivered is going to be dependent on the composition of the blend. It's going to be dependent mostly on the amount of tobacco burned, so that the content of nicotine in the blend is not the necessarily determining factor in how much is delivered in the smoke, and they're not the same thing. That's -- point of clarification I was trying to make.

Q. I appreciate that very much and my apologies.

Is it fair to say, Doctor, that various tobacco plants have various different nicotine levels?

A. I think that's fair.

Q. And that those nicotine levels vary from year to year within the same tobacco -- type of tobacco?

A. That's true. Flue-cured tobacco -- well, any of the tobaccos are going to vary based on rainfall, soil conditions, growing season, weather. It's an agricultural product --

Q. In fact --

A. -- and as such it varies.

Q. I'm sorry. I didn't mean to cut you off.

And, in fact, the nicotine level within a plant itself varies.

A. That's my understanding. And that's a part of what tobacco grading is about. The sugar content of those plants also varies.

Q. And Reynolds Tobacco for quite some time has known about the varying levels of nicotine amongst types of tobacco; is that fair?

A. I can't --

MS. FORBES: Objection to the form.

THE WITNESS: -- speak for what Reynolds knows. That's what I was told, how I've been taught, that nicotine and sugars and other things vary.

BY MS. KNISELY:

Q. Was that something that has been known at Reynolds since your commencement of -- of employment at Reynolds Tobacco?

A. We have certainly graded leaf -- that is, subdivided it by where on the plant it comes from -- since way before I came here.

Q. To your knowledge, was that grading based at all on the level of nicotine in those --

A. Not to my knowledge, no. It's based -- the way it's bought, it's bought by where on the plant it grows. It's bought by art. We have buyers who look -- who can look at the plant, smell it, the leaf, after it's been cured, and say this is good smoking quality leaf or it's not.

But, now, and for some time, the -- I understand that the tobaccos -- that there's not enough what we would call top-quality leaf out there, not as much as we'd like to have, and when it is there, it's very high priced.

Q. How far back have you known that nicotine plants -- the nicotine level in tobacco plants varies from type of tobacco to type of tobacco?

A. I don't know. Probably since shortly after I came here.

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Q. In 1968?
A. I'm sure that that was a part of my on-the-job training in tobacco science. There aren't many schools that teach you tobacco chemistry and tobacco science.
Q. When Reynolds blends the types of tobacco and the grades of tobacco together for cigarettes, do they take into consideration the nicotine level of those particular grades of tobacco?
MS. FORBES: Objection to the form. You may answer.
THE WITNESS: We analyze incoming product, that is, product coming from the stemeries, for nicotine and for sugars and for other things. We store product based on grade, as best we can, location, where it's grown, and most of all, on our evaluation of smoking quality, which is the basis of the grading system and has been for years.

What we like to do is we would like to have our nicotine consistent within a brand. If you're asking me do we go out and select tobaccos by nicotine to get a particular nicotine target in our products, no, we don't. It's logistically -- that would be logistically very, very difficult to do, because we're talking about huge masses of tobacco. And we don't do it.

BY MS. KNISELY:
Q. Do you blend -- do you blend tobacco to hit a nicotine target in your products?
MS. FORBES: Objection to the form.
MS. KNISELY: You can answer the question.
THE WITNESS: We blend our products, we blend tobaccos in our products to hit specifications for the product, but we don't blend it to hit a nicotine target. We blend more to hit tar targets, and the nicotine comes along with that.

BY MS. KNISELY:
Q. You said that one of Reynolds' goals was to have nicotine consistent -- a level of nicotine consistent within a particular brand. How does Reynolds achieve that consistency?
A. Well, we like to have -- really like to have all components of the product consistent as well as just nicotine. Certainly we have to have the tar consistent, because we're required to report tar within a milligram by the FTC method, and we're required to put that on our packs.

And if we didn't put it on the packs and it wasn't correct, that is, if it was inconsistent enough that it wasn't correct, then we'd be in trouble with the FTC, is my understanding. We have to substantiate what we claim.
Q. How does Reynolds achieve nicotine consistency in its products?
A. I thought I just answered that that --
Q. I don't believe you did.
MS. FORBES: Well, I think the witness believes he did. You asked him that question. He's given you a response. Why don't you give him a follow-up question for what you

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don't understand.
MS. KNISELY: It's not a matter of understanding. That answer was not responsive to the question: How does -- how does Reynolds achieve nicotine consistency in its products?
MS. FORBES: Beth, would you --
MS. KNISELY: If you like, we can have her -- the reporter read back the answer.
(PREVIOUS ANSWER READ BY REPORTER AS FOLLOWS:
Well, we like to have -- really like to have all components of the product consistent as well as just nicotine. Certainly we have to have the tar consistent, because we're required to report tar within a milligram by the FTC method, and we're required to put that on our packs.
And if we didn't put it on the packs and it wasn't correct, that is, if it was inconsistent enough that it wasn't correct, then we'd be in trouble with the FTC, is my understanding. We have to substantiate what we claim.)
BY MS. KNISELY:
Q. So how does the question --
MS. FORBES: Wait a -- wait a second.
Can you go back to the response before that response.
THE REPORTER: "We blend our"?
MS. FORBES: Yes.
(PREVIOUS ANSWER READ BY REPORTER AS FOLLOWS:
We blend our products, we blend tobaccos in our products to hit specifications for the product, but we don't blend it to hit a nicotine target. We blend more to hit tar targets, and the nicotine comes along with that.)
MS. FORBES: Thank you.
BY MS. KNISELY:
Q. So, Doctor, if you would answer my question: How does Reynolds obtain nicotine consistency in its products?
MS. FORBES: Same objection.
BY MS. KNISELY:
Q. In response to that question previously, you said Reynolds likes to have nicotine consistency and then talked about how you label your products with regard to tar consistency. How does Reynolds achieve nicotine consistency in its products?
MS. FORBES: Object to the mischaracterization.
Go ahead.

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MS. KNISELY: The record will speak for itself in terms of the answer.
MS. FORBES: Absolutely.
MS. KNISELY: So if you could answer the question for me, please.
THE WITNESS: I believe I said tar goes -- nicotine goes along with tar. Perhaps I wasn't explicit enough in that answer. And that is that we control for tar because we're required to, and given the blends, nicotine follows the tar. So, if the tar is going to go down, the nicotine is going to go down. We do not control for nicotine.
And when I said nicotine consistency, I should have said consistency overall with nicotine only being a portion of that. And we do not control specifically for nicotine, is my understanding.
BY MS. KNISELY:
Q. For how long have you known that nicotine follows tar levels?
A. I really don't know the answer to that question. I would say that that's a basic product development understanding.
Q. Was that something that was known at Reynolds at the time you commenced your work there in 1968?
A. I really can't say that -- that. I assume that it was.
Q. So your testimony here today, this afternoon, is that Reynolds Tobacco does not control nicotine in its products?
MS. FORBES: Objection. Mischaracterizes.
BY MS. KNISELY:
Q. I'm asking you if that's your testimony.
A. I think I've --
MS. FORBES: Objection. Same objection.
MS. KNISELY: You can answer the question.
MS. FORBES: Objection. Asked and answered. I think we went through this this morning.
MS. KNISELY: Doctor, you can answer the question.
MS. FORBES: Same objection.
THE WITNESS: I thought I had answered the question. I'm trying to find another way to answer -- explain my answer.
BY MS. KNISELY:
Q. I'm just asking, because there is a point of -- a lack of clarity on the record. And hopefully by late this afternoon or possibly first thing tomorrow morning, we will have a copy of the transcript of this morning's testimony.
But so I'm clear, does Reynolds Tobacco control nicotine in its products?
MS. FORBES: Objection.
MS. KNISELY: You can answer the question.
THE WITNESS: And I've told you that we do not -- Reynolds, to my knowledge, does not try to control nicotine to a target.
BY MS. KNISELY:

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Q. Do they try and control nicotine at all?
MS. FORBES: Objection. We went through this this morning. Do you mean other than what he's already testified to, which I think you've also asked him?
MS. KNISELY: No. I think there's been a change in testimony, so I want to be clear.
MS. FORBES: All right. All right. Let me just make sure that you are distinguishing in your mind, Ms. Knisely, your use and interchange of consistency and control. Okay?
MS. KNISELY: I know the difference between consistency and control.
BY MS. KNISELY:
Q. I am asking if Reynolds Tobacco Company controls the nicotine in its products.
MS. FORBES: Objection. Asked and answered.
BY MS. KNISELY:
Q. Does it control it at all?
MS. FORBES: Objection. Asked and answered.
BY MS. KNISELY:
Q. You said it does not control nicotine to a target. Does it control it at all?
MS. FORBES: Objection. Asked and answered.
MS. KNISELY: You can answer.
THE WITNESS: I don't know how to answer you further. This morning, as I remember it, we were talking about research products. Now we're talking about commercial products. There's a big difference.
MS. KNISELY: I'm sure we'll discuss it again tomorrow when we have the benefit of the transcript.
BY MS. KNISELY:
Q. Doctor, you said the amount of nicotine delivery depends on a number of things, including air dilution. How is the amount of nicotine delivery based -- affected by air dilution?
A. The amount of nicotine delivery, the amount of tar delivery, the amount of CO delivery, are all affected by air dilution, because what air dilution is is mixing the smoke with air. The more air dilution there is, the more air that's entering the product.
And for a given puff, air dilution is just what it sounds like it means. It means there's more air mixed with the smoke and, therefore, less tar, less nicotine, less all other components of the smoke delivered, because part of the puff is air.
Q. What are the means of achieving air dilution?
A. As I understand it, one is filter tip dilution, that is, holes in the tipping paper, which let in air at that point.
Another mechanism of air dilution would be in the porosity of the cigarette paper, that is, the amount of air that can pass through the paper. Both are the same basic principle.
Both air a low -- a low -- both allow air flow to mix with the smoke, so the more air

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dilution, the less tar delivery, the less nicotine delivery for a given puff or for a given cigarette.
Q. The holes on the filter tip dilution appear where on the cigarette?
A. Somewhat past the point that you would hold in your mouth.
Q. On the outside of where you would hold them in the mouth?
A. Right, for the most part. And, you know, people smoke differently. They hold them different ways. Some people hold them between their teeth.
Q. Are the holes in a place where a person smoking the cigarette could unknowingly block those holes?
MS. FORBES: Objection.
THE WITNESS: I don't know whether a person could or not. As I said, some people would hold them between their teeth. I would think where the dilution holes are, that most people would not.
I'm not expert in that area. And we have published some papers on vent blocking, as have others. I'm not current with what Reynolds' position on vent blocking is.
BY MS. KNISELY:
Q. If you took a filter -- a cigarette that had a filter tip dilution holes in it and you tested it on the FTC method for testing tar and nicotine levels, and you then took an identical cigarette and tested it with the holes covered, would the tar and nicotine levels be higher on the cigarette where the holes were covered?
A. Absolutely. If the -- if, as you said, the cigarette was diluted with tip dilution, yes, it would.
Q. On what commercial products has Reynolds used the filter tip dilution?
A. I really can't tell you. I'm not sure. But I can tell you that various degrees of air dilution are present in most if not all of our products.
Q. And what methods of dilution are used by Reynolds in their commercial products?
A. What methods of dilution --
Q. Of air dilution.
A. I'm sure filter tip dilution is the main one that I'm talking about. Although, cigarette paper porosity would certainly be another way to control the tar and nicotine or to dilute with air to reduce the tar and nicotine that would otherwise come out. Those are two methods that are used widely across the industry.
Q. Does Reynolds use the cigarette paper porosity dilution method?
A. I said the -- the main effect of dilution is the same whether it's done with the paper or whether it's done with filter tip dilution. It's mixing air, whichever way it's done.
I'm sure that our various brands have various paper porosities, which is a way of grading how much air can pass through the paper. And as you go down the tar range from full flavor to lights to ultralights, you probably are using -- and I'll say -- again, I'll go to

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cigarette manufacturers this time, rather than just Reynolds. That's one of the key ways that they reduce tar, that is, by a combination of porosity, paper porosity, and air dilution. There are other ways as well, but those are the principals.

Q. So, is it fair to say, if I understand correctly, the less porous the cigarette paper, the higher the level of tar and nicotine as measured on the FTC testing method?

A. Say it again, so I'm --

Q. Sure.

A. -- certain what you said.

Q. Sure. The higher -- I'm sorry. The less porosity of the cigarette paper, the higher the level of the tar and nicotine delivery?

A. That's correct. I believe. Let me restate it.

The less porous the paper, the less air passes through the paper and, therefore, for that given condition, the higher the tar and nicotine would be.

Q. And is it fair to say that the fewer holes in the filter tip dilution through the hole method you've described, the fewer holes and the smaller the holes, the higher the level of tar and nicotine delivered?

A. Generally true. The -- I think what you said is generally true. It's dependent on both the size of the holes and the number of the holes.

In some cases, air dilution is introduced by -- and again, I'm out of my field a little bit here -- by microperforation of the tipping paper. In some cases, it's laser perforation of the tipping paper. A number of different ways to do it. But all aimed at what's the percentage air that you're putting in to mix with the smoke.

Q. And which way -- never mind. Strike that.

You said this microperforation in the tipping paper. What is the tipping paper in the cigarette?

A. The tipping paper -- can I reach for a cigarette here and illustrate?

Q. Sure.

A. The tipping paper is the paper that covers the tip of the product, the --

Q. The filter?

A. Covers the filter and the filter plug and attaches the filter plug to the tobacco rod. There's an overlap in here where it's glued together. And that's the way you make the cigarette.

There's another -- when I say filter plug, there's cellulose acetate filter material in there, and that is coated by another paper which is called a plug wrap which turns that material into a filter. That's in turn coated by the tipping paper to hold the whole thing together.

So -- and that plug wrap can be of various porosity just like the cigarette paper itself.

And can I see the air dilution holes? I can't.

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Q. And the varying porosity of the plug wrap, that would affect the tar/nicotine delivery as well?
A. (Witness nods head)
Q. You need to respond orally --
A. I'm sorry.
Q. -- so she can take it down.
A. I'm sorry. Yes, it would.
Q. Now, we've talked about air dilution, filter ventilation, and paper porosity. We've talked about blend composition and blend. Is there anything else that would effect the nicotine delivery of a cigarette?
MS. FORBES: Objection to the form.
THE WITNESS: I don't -- I really don't know how to answer that one. There may be other things. Those are the things that would principally affect the nicotine and tar delivery of products.
BY MS. KNISELY:
Q. What about the size of the filter?
A. The size? You mean the length?
Q. The length. I'm sorry. The length.
A. The length probably would not dramatically affect it. What really matters more is the density of the cellulose acetate filter. And again, I'm -- if I told you there were units that go with that, and I told you they were deniers per filament, I'd be way out of my field.
THE REPORTER: I need it again.
THE WITNESS: Deniers per filament. It's a measure of the cellulose -- cellulose acetate to some respect -- to some extent -- and I'm going way far afield from what I know now, because I'm not an expert in cellulose acetate. But I know there are different thicknesses of fibers and there are different densities.
BY MS. KNISELY:
Q. Is it a fair statement to say the denser the cellulose acetate in the filter, the lower the tar and nicotine delivery?
A. As a general statement, that's probably okay. But as I -- as I said, I'm getting out of my expertise area here.
Q. On Reynolds brands cigarette products, do its brands have varying -- or filters with varying cellulose acetate densities?
A. Probably so, yes.
And let me reiterate that I'm not an expert in filter technology, except in the very general.
Q. Does the circumference of the tobacco rod affect the tar and nicotine delivery?
A. All other things being equal?
Q. Yeah.
A. Probably does, yeah.
Q. Are Reynolds' cigarette products all of the same -- the tobacco rods of their cigarette products all of the same circumference?
A. No.
Q. Some are larger than others?
A. If I -- if you want to generally classify them, there are some that are -- I call standard

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size, which is the diameter circumference of most cigarettes sold.

There are some that are wides, which are higher circumference. There are some which are slims, which are narrower circumference. And there are some which are superslims. We don't -- I don't know that we make a superslims. I'm not sure about that.

Q. Is it fair to say that the smaller the circumference of the tobacco rod, the lower the tar and nicotine delivery?

A. You said the smaller the circumference, the lower the tar and nicotine delivery? All other things being equal --

Q. Yes.

A. -- yes.

Q. For how long has Reynolds Tobacco been using the filter tip dilution in its products?

A. It goes back into the -- and again, this is -- this is going to be real rough. It goes back into the '70s sometime. It was part of our general -- one of the tools that we used in reduction of tar and nicotine over time, going back all the way to 1954, '55 products, which were 35 to 40 milligrams of tar.

If you look at the whole story, what's happened is we've used numbers of different ways to reduce tar and nicotine over time. A couple of them I didn't talk about.

Basically, the more tobacco you burn, the more tar and nicotine and other smoke components you're going to get, so that a couple of other ways that we've used to historically reduce tar are the reconstituted sheet process, which involves burning less tobacco; the puffing process, which came along later on, which means you have to use less tobacco weight, less tobacco in terms of weight, to make a cigarette rod; and somewhere, probably in the '70s, we get into air dilution, filtration efficiency, how dense -- for lack of a better term -- the filter is, came before air dilution.

So, air dilution is probably fairly late in the game in terms of reducing tar and nicotine, probably in the -- sometime in the '70s, late '70s, perhaps.

And again, these times, please don't hold me to any of these. They're just sort of -- sort of chronological flow but the dates may be way off.

Q. When you say the puffing process, you're talking about expanded tobacco?

A. Right.

Q. G13?

A. Right.

Q. Freon?

A. Or G19. Carbon dioxide. Any method that you use that expands the tobacco, whether it be Freon or carbon dioxide or whatever.

Q. And Reynolds Tobacco first expanded their tobacco in the early '70s with Freon; is that correct?

A. I don't remember the dates, but, yes, Freon.

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Q. And that was the G13 process?
A. That's correct.
Q. And that was subsequently replaced by the G19 process, puffing the tobacco with carbon dioxide?
A. G19 I'm using as a generality. We've got so many different "G" processes, G19, G42, G -- I don't know how many different ones there are. But they are all puff tobacco, and most done with carbon dioxide.
Q. Is there any one -- strike that.
What substances have been used by Reynolds to puff tobacco other than Freon and carbon dioxide?
A. I'm aware of some research that goes way back, but just barely aware of propane or pentane, low boiling, hydrocarbon, linear, straight chain hydrocarbon materials. I'm sure we've looked at many different ways of puffing tobacco in all.
Q. From a commercial standpoint, what are the -- the substances that have been used in Reynolds' commercial products to puff tobacco?
A. Those that I know of, predominantly G13 with Freon, and CO2.
Q. And when you say "predominantly," are you aware of any others that Reynolds has used commercially?
A. I couldn't -- I'm not an expert in that. I don't know what we've used commercially. Those are certainly the two principal processes. We have tested, I know, other materials, but have found some of them -- well, for instance, we tried a Freon replacement. We rejected that because, when we did the studies, we found what we call strangers, and the tox people didn't like those results. So we didn't even use that.
Q. You mentioned reconstituted tobacco sheet --
MS. FORBES: Before we go into recon, let's just take a quick five-minute break.
VIDEOGRAPHER: Off record at 3:44.
(BRIEF RECESS)
VIDEOGRAPHER: We're back on record at 3:56.
BY MS. KNISELY:
Q. Doctor, I think we left off, we were just about to get into reconstituted tobacco. Can you tell me what reconstituted tobacco is?
A. I can tell you from a general knowledge standpoint. Reconstituted tobacco is small particles of stem and sheet tobacco from various sources. It's all tobacco, but it's too small to use in cigarettes as cut filler.
And we take that tobacco and put it through basically a paper-making process where we extract it with water, and then we form a paper-like sheet. And then we put the extract back on the sheet which allows us to use tobacco we couldn't otherwise use.
Q. When you say you put the extract back on the sheet, is it the exact same extract that was taken out of the tobacco stems that make up that particular sheet?
MS. FORBES: Objection to form.
THE WITNESS: To the best of my

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knowledge, we extract the sheet -- excuse me -- we extract the scrap and the small particles and the stems with hot water. We grind up the cellulosic materials which are left behind. We form a sheet from that. And we spray the extract back on.

I don't know whether we spray all the extract back on, now. I know at times in the past we haven't sprayed all the extract back on.

BY MS. KNISELY:

Q. But the extract that's sprayed back on, whatever percentage of it that is sprayed back on, is that the same extract from the stems and -- and little bits and pieces that make up that sheet on which the extract is being sprayed?

A. I think so.

Q. Prior to being sprayed back on, is -- does the extract undergo any process?

MS. FORBES: Objection to the form. Go ahead.

BY MS. KNISELY:

Q. Let me rephrase it. What happens to the extract between the time it is extracted and the time it is sprayed back on?

A. I'm really not too sure. I think it may be concentrated somewhat. I would think you'd have a lot of water in there, when you're doing the extraction. So I think it's probably concentrated down with having some of the water removed before it's put back on. That's, again, my layman's understanding.

Q. Is it combined with any other extract taken from a different -- strike that.

Let me try and -- and see if I can clarify. If you have what we'll call a particular lot, for lack of a better term, of stems and pieces, and you do the water extraction with Lot 1, and you take the extraction, water extraction, from that Lot 1 and put that someplace, you create the sheet out of the cellulose from Lot 1, and then you -- do you spray back on that re -- that sheet the extract from only Lot 1?

A. That's a hard question for me to answer, because we're talking about a continuous process. It's not done in lots or batches, so that feed material is going in all the time and sheet -- finished reconstituted sheet is coming out the other end of the process all the time. So it's not a batch process or a lot process.

Q. The extraction, the water extraction that's extracted from the -- the stems and the other bits and pieces of tobacco in this process, when it is -- when the extraction is concentrated, does that also concentrate the mid level of nicotine in that extract?

MS. FORBES: Objection to the form.

BY MS. KNISELY:

Q. Let me rephrase it. Does it increase in parts the amount of nicotine or the percentage of nicotine in that extract?

MS. FORBES: Objection to the form.

BY MS. KNISELY:

Q. Then I'll phrase it this way: What happens to the nicotine when the extract is concentrated?

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MS. FORBES: Objection to the form.
MS. KNISELY: You can answer the question.
THE WITNESS: If I understand the question correctly, the answer is that the nicotine in is the same as the nicotine out, unless we are still throwing away some of the concentrated extract, which we used to do. And I don't know whether we still do this now or not. In the case that we did, it would be less.
BY MS. KNISELY:
Q. Let me give you an example. Maybe this will clarify it in my mind.
Say you have a hundred gallons of extract that have come out of the extraction process of Lot 1, and that --
MS. FORBES: Well, objection.
MS. KNISELY: Just by example.
MS. FORBES: All right.
MS. KNISELY: Pure example.
MS. FORBES: With the understanding that it's not a lot or batch process, as he indicated.
MS. KNISELY: That's right. Yes.
MS. FORBES: Go with the flow, if it can be answered.
MS. KNISELY: Yes.
BY MS. KNISELY:
Q. I'm just trying to -- to -- I understand it's not a lot or a batch. But if you have a hundred gallons of extract, and you concentrate it by removing water down to, just for ease of numbers, fifty gallons, and the hundred gallons had a certain nicotine level, would that fifty gallons of concentrated have the same nicotine level?
MS. FORBES: Objection to the form.
THE WITNESS: I don't know. I do know that we don't add any nicotine in the process. And, in fact, as I've already said, if we're still discarding some of the extract, then the total nicotine and other materials that are soluble in water is going to be less as it goes back onto the cellulosic sheet.
So it's -- I don't know. The materials that go in get messed around and come out as whatever they are. But they're the same levels of materials in and out unless there's loss somewhere along the way.
BY MS. KNISELY:
Q. What forms can nicotine take?
MS. FORBES: Objection. Overbroad.
BY MS. KNISELY:
Q. In what state of being can -- can nicotine take? Solid? Liquid? Gas?
MS. FORBES: Objection.
MS. KNISELY: You can answer the question.
THE WITNESS: Nicotine is a liquid.
BY MS. KNISELY:
Q. Nicotine is a liquid?
A. At -- when I say nicotine is a liquid, at room temperature or above.
Q. What --

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A. I assume you could freeze it --
Q. Let's start with --
A. -- and make it a solid.
Q. -- nicotine as a liquid at room temperature. And when nicotine is in a water solution, how is nicotine measured? In parts per -- in -- in parts per million? How is nicotine measured in a -- in a water solution? How is it quantified?
A. If we were going to look at nicotine saying the FTC determination, it would probably be determined by gas chromatography.
Q. I'm not talking about an -- an FTC method. If I had a solution of water --
A. But that is nicotine in a water solution. It's nicotine plus other things in a water solution. And we would take -- however the process works, however the analytical determination works, we would analyze for nicotine in a water solution, whether we move it -- so that's an example of nicotine in a water solution.
Q. So --
A. How would we determine it?
Q. -- you would use it through gas -- gas chromatograph?
A. Yes. That's the way I think that we curretnly do the nicotine determination.
Q. And -- if nicotine were in a water-based solution. And what would be the -- the unit of measurement for nicotine in a water solution?
A. The unit would be nicotine in milligrams or micrograms, or whatever, however I chose to set those out.
Q. Why don't we, for argument's sake, say in milligrams. It doesn't much matter --
A. Okay.
Q. -- to my example --
A. What percentage --
Q. -- whether it's micrograms or milligrams. We'll -- we'll take milligrams.
A. Okay. We could take milligrams. We could take parts per million. We could take milligrams per --
Q. As -- as long as we're on --
A. -- gram of tobacco, or whatever --
Q. As --
A. -- once we've measured it and we know we can express it however we want.
Q. Okay. Then let's talk about it in milligrams.
A. Okay.
Q. If you have the water extract from reconstituted tobacco --
A. Uh-huh.
Q. -- and you have the water extract, and you analyze it through your gas chromatograph, and it comes up, just for argument's sake, ten milligrams per gallon of water, and then that water extract is concentrated by removing the -- removing some of the water, say for argument's sake, you reduce it by half, how -- and then you analyze it with a gas chromatograph. How will that concentration of the water extraction affect the measure in milligrams of the nicotine in the concentrated water

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extraction?
MS. FORBES: Objection to form.
MS. KNISELY: Do you understand the question?
THE WITNESS: I under -- I think I understand the question.
MS. FORBES: And -- and just -- also, for the record, you realize this is a fact witness, and that is a hypothetical.
MS. KNISELY: I'm just trying to understand -- it's an example. I'm just trying to understand the process.
MS. FORBES: I understand. Objection.
MS. KNISELY: You can answer the question.
THE WITNESS: First of all, it would probably be -- I'd like to know how you reduced it. If you reduced it by heating to drive off the water, you would probably drive off some of the nicotine as well; that is, it would -- it -- it sort of co-distills with water.
BY MS. KNISELY:
Q. Then let me add something to -- to that that might clarify that.
Whatever process Reynolds would use to concentrate the water extract, to remove the water, whatever process they would use to -- to remove the water, or some of the water from the water extract, is the process that would be used in this example.
MS. FORBES: I'm sorry. Objection.
THE WITNESS: I don't know what the process is.
MS. FORBES: I don't know how you possibly could answer that question.
BY MS. KNISELY:
Q. You don't know what process Reynolds uses to remove the water from -- some of the water from the water extract before it sprays it back onto the reconstituted tobacco sheet?
A. I'm not sure. I'm just not sure.
Q. Who would know what that -- what process Reynolds uses to do that?
A. Someone who is in tobacco processing or someone who is in PT & D, product -- process technology development. I think that's still the name of that division.
Q. Who heads process technology development?
A. Watt Dufour.
Q. W-A-T-T?
A. W-A-T-T, D-U-F-O-U-R.
Q. And how long has -- I assume it's Dr. Dufour?
A. No, it's not.
Q. How long has Mr. Dufour headed process technology development?
A. I don't know. It's been probably three or four years. Excuse me. I may have my structure wrong here.
Ron Willard may own all of process technology, PT & D. Watt Dufour certainly knows processing and deals with processing, probably more than Ron does. So the name is right; the title was wrong.

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Q. Is it a Dr. Willard?
A. No.
Q. Before we got onto reconstituted tobacco, we were talking about air dilution. Is a cigarette made with filter tip dilution holes safer than one without them everything else being equal?
MS. FORBES: Objection --
THE WITNESS: A cigarette --
MS. FORBES: Objection to the form. Go ahead.
THE WITNESS: I can't talk about safe or safer. It's not in my area. I'm not a toxicologist. What I can say is the identical cigarette with and without filter tip dilution, the more filter tip dilution you have, the lower the tar and nicotine are going to be.
And when we talk about tar and nicotine, I'm talking about tar and nicotine as determined by the FTC method, in all cases -- or maybe not. Unless I say otherwise, assume that it is FTC.
MS. KNISELY: I try not to assume anything.
THE WITNESS: But in this case, I'm asking you to make that assumption because it -- it sort of flows automatically. When we talk about numbers, all those numbers are by FTC method.
MS. FORBES: See what happens when you start with hypotheticals.
MS. KNISELY: Then I get to assume something. Everybody assumes something.
BY MS. KNISELY:
Q. We should probably go back and see if we can finish your history here.
A. We only have five or six more years to go.
Q. I know. And there are probably three or four positions in those five or six years.
With -- you had started talking about Project XA and XB, and we got off on Project XB. We never really talked about Project XA.
A. Okay.
Q. You indicated that it was to reduce -- that it had to do with reducing sidestream smoke. What more specifically was Project XA?
A. I'll have to go back in time a little bit to put that in context. Work has been done at Reynolds for many years trying to reduce sidestream of our -- of a product, to introduce a new product with reduced sidestream, because all our market research showed that that was a very interesting concept to smokers who buy our products.
Sidestream -- sidestream smoke, if I can define it after this long day, is the smoke that comes off the lit end of the cigarette.
Q. Smoke that comes off the lid?
A. Off the lit.
Q. Lit cigarette?
A. Lit end, the burning end, of the cigarette. It's annoying. That smoke is annoying to some people. And a cigarette which had less of it would be less bothersome and annoying to some and would be probably more socially acceptable. Now, we're talking about going back into the '70s at this

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point.

We developed some products which had reduced lit-end smoke. We introduced those products into test market with Vantage XL. The products did have some reduction of -- around 50 -- 40 to 50 percent reduction in sidestream smoke as measured by a particular technique, which I'm going to skip for the moment, unless you really want to know about it.

The consumer couldn't -- it was not apparent to the consumer that the reduction was that great. The consumer could certainly tell that there was less, but it wasn't enough less, and the product had some offtaste. It wasn't as consumer acceptable as we would have liked for it to have been in terms of the taste of the product, because of the materials used to get that sidestream reduction.

We withdrew Vantage XL from the market to do two things: One, to see if there was a way to get a larger percentage sidestream reduction -- and what -- and to make the product taste better.

XA came off market research from Vantage XL, and later market research had said this was maybe even a bigger idea now than it had been earlier with all the ETS controversy that was out there, because, obviously, sidestream is a part of ETS. ETS, environmental tobacco smoke, is partially sidestream and partially exhaled mainstream smoke. So there was interest in doing that.

We looked at a number of different technologies in XA, ranging from using a -- a carbonatious black -- let me simplify it. Let me say black carbon material, which was made from tobacco or other things, which was basically preburned, if you want to say that, tobacco. Again, a way to reduce the amount of tobacco burned in the smoking process and to, therefore, reduce the lit-end smoke, because the less tobacco burned, the less smoke off the lit end or sidestream there's going to be.

That started before I inherited the XA project. It was -- I think we called it the carbonatious material. I think it was called Char. And it was a mixture of carbonized tobacco and tobacco in the rod. That indeed reduced -- together with some changes in the paper, that reduced the sidestream pretty effectively. It also improved the taste relative to Vantage XL, which had not tasted good enough.

The net-net was that when we showed this product to consumers in focus groups, they said: What's that black stuff in my cigarette? So that approach to reducing sidestream got terminated pretty quickly.

We also looked at different paper configurations. We tried changing the porosity of paper, which also impacts sidestream smoke. We tried special double-wrapped -- that is, two wrappers of special paper around the tobacco. And we never commercialized any of those products here

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in the United States.
That technology was later picked up by Tobacco International and modified further. And there are products on the market in Japan now from that work, or from further modifications of that work.
Q. And what brand is -- is -- is that in Japan?
A. It's Salem Pianissimo. And I think we have a nonmenthol version called Premier Pianissimo not related to the other Premier in any way. Both reduced sidestream products.
Q. The Salem Pianissimo, does it have a carbon filter?
A. You know, I don't know. I'm not sure.
Q. Does --
A. It -- it may have. I'm not sure about that.
Q. How is it -- you said it was --
A. Let me rephrase -- I'm trying to think --
Q. Sure.
A. -- through this. It may have a charcoal filter or a carbon filter, because most Japanese products do.
Q. You said that Project XA was later picked up by Reynolds International and put on the market in Japan with further -- further modifications. What were those further modifications?
A. You know, I don't know.
Q. Do you --
A. Because I finally left that area in -- believe it or not -- in 1992.
Q. Do you know why those further modifications weren't attempted in the United States?
A. As a part of the XA project, we had lots and lots of discussions with marketing and marketing research. And marketing research again researched the -- the topic in 1992 as far as consumer appeal was concerned, and came to the conclusion that the level of consumer appeal we thought was out there was not.
Some debate between R & D and marketing and marketing research as to whether we should carry that work onward. But we did stop it in 1992 because of marketing research's finding of lack of sufficient consumer appeal, I should say.
Q. When you said stop that work, do you mean stop trying to lessen sidestream smoke or to stop Project XA?
A. Officially stop Project XA.
Q. Were there further attempts by Reynolds to try and limit sidestream smoke?
A. Not for -- not by that mechanism, not by -- I'm sorry. I'm getting tired and my mind's fading. But not by that specific technology.
The person who was working there, who was head of Project XA, was -- was very vocal to the senior management of Tobacco International and kept talking about it until finally they took it up and it led to the introduction of those two products that I talked about, which are, by the way, very successful in Japan.
Q. Who was head of Project XA?
A. Allen Norman.
Q. What are the -- the further attempts that

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Reynolds Tobacco made to try and limit sidestream smoke once Project XA was stopped in this country?
A. Well, Eclipse certainly does.
Q. Any other project?
A. I don't think so. I don't think of any that were directly aimed at sidestream reduction. Of course, Eclipse is aimed at ETS reduction overall and is very successful with that, because it has almost no sidestream.
Q. If I could go back for a minute, when we were talking about reconstituted tobacco sheet. You'd indicated that the tobacco stems and bits and pieces were extracted with a water solution. Does not Reynolds also use ammonia in that process?
A. I think we do use an ammonia source called di-ammonium phosphate somewhere in that process.
Q. Do you know where in that process?
A. No, I don't know specifically. It may be added to the extract.
Q. Do you know for what purposes di-ammonium phosphate is used in the reconstituted tobacco process?
A. I have to go back some -- for some history again.

PM's product is -- Marlboro specifically -- is traditionally a smoother, milder, less harsh product than is our Winston and some of our other -- Winston, Winston Light, Camel, Camel Light, and so on. We think that PM uses di-ammonium phosphate in their reconstituted sheets. And they have more than one kind. So a lot of experimentation has been done adding di-ammonium phosphate to sheet.

Q. Experiments by Reynolds Tobacco?
A. By Reynolds.

And by the way, there is -- there is many G7 variances, there are G13 variance, a number of different G7's, G7-10, 42, and so on. There are a whole bunch of different numbers. So there are somewhat different sheets.

Q. And what are they -- what are they -- what are the difference between the various G7's?
A. I really don't know.
Q. Who would know that?
A. As long as I've thrown Watt Dufour's name out here, he's probably fairly expert in that area too.
Q. How does di-ammonium phosphate affect nicotine?

MS. FORBES: Objection.

BY MS. KNISELY:
Q. If at all.
A. How does it affect nicotine? Well, it's -- di-ammonium phosphate is basic.
Q. So how does that affect nicotine, if at all?
A. I do know what the effect in the -- in the sheet would be. I don't know that we know -- well, I'm -- I'm not expert in this.
Q. Who would be -- who would know how di-ammonium phosphate affects nicotine?
A. Well, if anybody knows about di-ammonium phosphate, it's Watt Dufour.
Q. Dufour. Sounds like a knowledgeable man.
A. Well, we were talking still about G7 sheet

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and processing.
 Q. Would Watt Dufour also likely know how di-ammonium phosphate affects nicotine delivery?
MS. FORBES: Objection to the form.
BY MS. KNISELY:
 Q. If at all.
MS. FORBES: Same objection.
THE WITNESS: Can you -- can you rephrase to be more specific?
MS. KNISELY: Sure.
BY MS. KNISELY:
 Q. What effect, if any, does di-ammonium phosphate have on the delivery of nicotine?
 A. I don't know whether in effect it has any or not. I said that in part of my rambling preamble to this, that one of the reasons he wanted to look at di-ammonium phosphate was that PM's products are smoother and milder than ours, and that we looked at it for that reason.
 Q. I guess I'm asking more from a chemical standpoint: What effect does di-ammonium phosphate have on delivery of nicotine? Not from a harshness or smoother or milder kind of perspective, but from a chemical perspective.
MS. FORBES: Objection. Overbroad.
THE WITNESS: I don't know exactly how to answer that. Let's try again.
BY MS. KNISELY:
 Q. Okay. Chemically, what, if any, effect does di-ammonium phosphate have on the delivery of nicotine?
MS. FORBES: Objection. Overbroad.
THE WITNESS: I really -- I don't understand the question as you've posed it.
BY MS. KNISELY:
 Q. Can you tell me what it is that you don't understand about the question or what gives you some concern about the question?
 A. It's not a concern about the question, as I don't quite understand what you're asking me.
 Q. Okay. Let's try it this way: Does di-ammonium phosphate in any way react chemically with nicotine?
 A. Does it in any way react chemically with nicotine? I'm going to make an assumption and see if I can move this along.
 Q. Okay.
 A. If I had a beaker of water, water --
 Q. Uh-huh.
 A. And I put di-ammonium phosphate in that water, and I put nicotine in that water, then it would be basic, and it probably wouldn't have any effect on the nicotine. You'd have a basic solution of nicotine, di-ammonium phosphate, or whatever the form of it is in water, and that's what you'd have.
 Q. When you say "basic," do you mean from a pH standpoint?
 A. Yeah. Basic from a pH standpoint in water, because pH refers to solutions in water.
 Q. What if you then take that solution and heat it?
 A. If you put di-ammonium phosphate and nicotine

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in water and you heated it, it might liberate ammonia, such that you would still have a basic solution of nicotine, ammonia, di-ammonium phosphate, or breakdown products thereof including ammonia. This is a theoretical beaker we have sitting on the table here.
Q. Let's make it a little more real, if we can. As I understand it, Winston Natural -- are you familiar with the Winston Natural product?
A. Are you talking about the No Bull product?
Q. Yes.
A. Okay.
Q. You're familiar with that product?
A. Yeah.
Q. That product, as I understand it, does not have ammonia added to it during the reconstitution tobacco process, correct?
A. Di-ammonium phosphate added --
Q. Yes.
A. -- during the reconstitution process? That's my understanding; it does not.
Q. My understanding is that is truly only a water extraction process.
MS. FORBES: Objection to the form.
BY MS. KNISELY:
Q. Is that correct?
A. My understanding is that it has no additives.
Q. Is it your understanding that the only substance that is used in the -- in the extraction process for the reconstituted tobacco that's used in the Winston Natural is water?
A. I really don't know, but I would assume that to be true. If it doesn't have any additives, it doesn't have any di-ammonium phosphate.
Q. So if we take a Winston Natural cigarette and on your standard method of the FTC and we measure the nicotine delivery based upon the FTC measurement of a Winston Natural cigarette versus a Winston cigarette that is otherwise identical except it contains di-ammonium phosphate as part of the reconstituted tobacco that's contained within it, are we going to have a higher or a lower nicotine delivery level?
MS. FORBES: Objection to the form.
MS. KNISELY: You can answer the question.
MS. FORBES: Well, and -- and, just for the record, there's not a product called Winston Natural. It's called Winston. It's a national product. It's the new Winston. It's not called Natural Winston.
MS. KNISELY: My apologies. That's -- I'm just calling it by what the -- on the billboard.
MS. FORBES: Well, the billboard --
THE WITNESS: I think the billboard says "No Additives" --
MS. FORBES: It says --
THE WITNESS: -- or "No Bull" or --
MS. KNISELY: The ones in Pennsylvania started out with "Winston Natural." It said "Winston" and it said "Natural." My

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apologies. Just to give it --
THE WITNESS: It may have been a test -- a local test or something. I don't know. But it's a national campaign.
MS. FORBES: The product is called Winston.
THE WITNESS: It's Winston.
And your question again?
MS. KNISELY: Could you read it back, please.
(PREVIOUS QUESTION READ BY REPORTER)
THE WITNESS: I don't know the answer to that, but I suspect we will have no difference.
BY MS. KNISELY:
Q. Has that ever been tested?
A. Not exactly the way you put it, because there are other additives in former Winston and in some of our other products, so it's not just a difference of di-ammonium phosphate.
I suspect the amount of nicotine delivery by the FTC method is probably for the Winston that is currently out there with no additives. I suspect it's probably just about what it was almost -- I would bet, it's close to exactly what it was when Winston had additives.
The reason I'm putting those qualifiers on there is there are other additives that have been taken out to get to the current Winston No Additives that were in old Winston and are in other products which are similar.
Q. When nicotine is pyrolyzed, what happens to it?
A. It pyrolyzes.
MS. FORBES: Objection. Over -- overbroad.
BY MS. KNISELY:
Q. What happens when you burn nicotine?
MS. FORBES: Objection. Overbroad.
MS. KNISELY: You can answer the question.
MS. FORBES: Are we back to a beaker? What are -- what are we --
MS. KNISELY: No.
BY MS. KNISELY:
Q. Just when you burn nicotine, what happens to it?
MS. FORBES: Objection.
BY MS. KNISELY:
Q. When you burn nicotine in a cigarette, what happens to it?
MS. FORBES: Objection to the form.
BY MS. KNISELY:
Q. Nicotine --
MS. FORBES: That -- that --
MS. KNISELY: Let me rephrase.
BY MS. KNISELY:
Q. Nicotine is contained in cigarettes, correct?
A. Yes.
Q. When you light up a cigarette and you burn the cigarette, what happens to the nicotine in the cigarette?
A. Okay.

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MS. FORBES: That's the right question.

MS. KNISELY: I don't know. I thought that was the same as --

MS. FORBES: It's not.

MS. KNISELY: -- what happens when you --

THE WITNESS: It's not.

MS. FORBES: That's because you don't understand what happens.

THE WITNESS: All right. When you burn nicotine -- when you -- when you smoke a cigarette, nicotine, or any other component in there, is exposed to a range of temperatures, from right behind the fire cone of about 900 degrees centigrade, which drops down a few millimeters back from that smoke formation zone to three or four hundred degrees centigrade, which drops further to close to room temperature by the time it exits the mouth end of the cigarette. That's a huge temperature gradient.

In that -- within that gradient, several -- or within that temperature range, several different things happen.

At the extremely high temperatures, nicotine and other organic compounds are probably burned up to oxides, to nitrogen oxide, carbon monoxide, carbon dioxide, water, et cetera, for all organic compounds at that very high combustion temperature.

As you get into the zone that's three or four hundred degrees centigrade, other things happen. You get distillation, which means the compound nicotine or other vaporizes, becomes a vapor, and travels further down the rod intact without change.

Another process that can happen in that zone is pyrolysis, which is the word you used in the question before, which is why I couldn't quite answer the question that way. That pyrolysis breaks down nicotine into other organic compounds. Those compounds can react with each other, likewise for all other organic compounds, including nicotine. You get pyrolysis, you can get reaction and recombination of those very chem -- of those chemicals, and as a result you can also get pyrosynthesis, which means these compounds react with each other to make new compounds.

So by the time you're out of that temperature zone, you got a mass gamish that's -- that's a real technical term, gamish, but it's the basis of tar.

So what happens to nicotine? Part of it's burned up, combusted. Part of it's distilled and comes across intact. Part of it's broken down into other components which might be peridines and -- you know, I -- I don't want to get too technical for you. But there are other nitrogen compounds that would be formed.

And as I said, you got a gamish of -- or a soup of lots and lots of organic products from that. So, you got a great gamish that becomes tar. And some of it becomes vapor

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phase. I guess tar generally is the way I ought to characterize that.

Does that --

BY MS. KNISELY:

Q. Well, we'll come -- I appreciate that, and we'll come back to that in a minute. I want to go back to the di-ammonium phosphate, if we can, for a second.

We had talked about what effect, if any, the di-ammonium phosphate has on the nicotine transfer or nicotine -- I'm sorry -- nicotine delivery as measured by the FTC method.

What if -- you had earlier defined nicotine transfer in two different ways. One way was the transfer from the cigarette to the smoke, and the second way was the smoke to the body. Correct?

A. Correct.

Q. I want to talk about the second way.

A. Okay.

Q. Does di-ammonium -- what, if any, effect does di-ammonium phosphate have on nicotine transfer of the nicotine in the smoke to the body of the smoker?

A. And I think I commented earlier that I'm not expert in that area. I'm not a psychophysiologist or a pharmacologist or whatever that is.

Q. Who would -- who at Reynolds would be able to answer that question, or most likely to be able to answer it?

A. I'd refer you to John Robinson.

VIDEOGRAPHER: Excuse me, Counselor. We have five minutes left on the tape.

BY MS. KNISELY:

Q. With regard to -- have you ever heard the phrase "nicotine absorption"?

A. I'm sure I've heard the phrase.

Q. Do you have any understanding of what -- what it is?

A. (Witness shakes head)

Q. If I wanted to know what effect, if any, di-ammonium phosphate's effect on nicotine absorption, absorption of the human body, of the nicotine that is taken in in the smoke, who would I ask at Reynolds?

A. John Robinson.

Q. You indicated that there are -- well, before we go into that, you mentioned a term, I believe it was "bioactive," or "bioreactive," earlier today.

A. I might have said biological activity.

Q. Biological activity.

A. I said one of the -- one of the objectives of the Premier project was to reduce the biological activity relative to other cigarettes.

Q. What did you mean by biological activity?

A. Again, I'm going to give you that familiar "I am not a toxicologist however."

What -- what I mean by biological activity in my chemist understanding is that cigarette smoke tests positive in certain biological tests. If you're going to reduce that biological activity, what I would mean by reducing biological activity is to find products which gave

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less response in those tests that are used routinely to measure the biological activity of cigarette smoke.
Q. Do you know what tests are used to test the biological activity of cigarette smoke?
A. I know the names of some.
Q. And they are?
A. Ames, Ames test, sister chromatid exchange, chromosonal aberration, various inhalation tests.
Q. Is nicotine bioactive?
MS. FORBES: Objection to the form.
THE WITNESS: Can you restate?
MS. KNISELY: Sure.
BY MS. KNISELY:
Q. Is the inhalation of nicotine when smoking a cigarette bioactive?
A. I don't really know what you mean by bioactive. We were talking about Ames test and animal inhalation test and -- how do you -- help me.
Q. Let me see if I can. As part of the smoke a smoker breathes in when they smoke cigarettes, there is nicotine contained within that smoke. And that nicotine is taken into the lungs of a smoker. Is the nicotine contained within that smoke bioactive? Does it react with the body?
A. As I said, I can't speak as an expert toxicologist, psychophysiologist, whatever the hell those people are that work in that area. Do you mean, does it have an effect on the body?
Q. Yeah.
A. Okay.
MS. KNISELY: Go ahead. I think that means you can answer.
THE WITNESS: Yeah, it probably has an effect. I think when I take in food it has an effect. And if you're talking about bio whatever you said in those general terms, yes.
MS. KNISELY: Let me see if I can be more specific --
VIDEOGRAPHER: Counselor, we're just about ready to run out of tape. Maybe one question.
BY MS. KNISELY:
Q. Have you heard of the term "tumor promoter"?
A. Yes.
Q. Is nicotine a tumor promoter?
A. I don't have a clue.
Q. Is nicotine carcinogenic?
A. I don't know. Ask a toxicologist. To my general knowledge, I don't think so.
VIDEOGRAPHER: Counselor, we need to change the tape.
MS. KNISELY: Okay.
VIDEOGRAPHER: This concludes Tape Number 3 of the Dr. Robert A. Lloyd, Jr., deposition. The time is 4:51.
(DISCUSSION OFF THE RECORD)
MS. FORBES: Just briefly for the record, Dr. Lloyd has put in a full day, and we're going to go ahead and start up again tomorrow morning at nine.
MS. KNISELY: We'll be here at

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nine.

(SIGNATURE RESERVED)

(DEPOSITION CONCLUDED AT 4:52 P.M.)

JURAT

I, Robert A. Lloyd, Jr., Ph.D., do hereby certify that I have read the foregoing transcript of my testimony, taken on October 1, 1997, and have signed it subject to the following changes:

PAGE	LINE	CORRECTION

Sworn and subscribed to before me on this ___ day of

NOTARY PUBLIC _____

STATE OF NORTH CAROLINACOUNTY OF FORSYTH

REPORTER'S CERTIFICATE

I, Elizabeth S. Girvan, a Notary Public in and for the State of North Carolina, do hereby certify that there came before me on Wednesday, October 1, 1997, the person hereinbefore named, who was by me duly sworn to testify to the truth and nothing but the truth of his knowledge concerning the matters in controversy in this cause; that the witness was thereupon examined under oath, the examination reduced to typewriting under my direction, and the deposition is a true record of the testimony given by the witness.

I further certify that I am neither attorney or counsel for, nor related to or employed by, any attorney or counsel employed by the parties hereto or financially interested in the action.

IN WITNESS WHEREOF, I have hereto set my hand and affixed my official notarial seal, this the 4th day of October 1997.

Elizabeth S. Girvan, Notary Public

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